LOW SERUM ZINC LEVEL –POSSIBLE MARKER OF SEVERE PNEUMONIA

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BRANCH - VII

DEPARTMENT OF PAEDIATRICS

COIMBATORE MEDICAL COLLEGE HOSPITAL

COIMBATORE

APRIL 2016

CERTIFICATE

Certified that this dissertation entitled "**LOW SERUM ZINC LEVEL –POSSIBLE MARKER OF SEVERE PNEUMONIA"** is a bonafide work done by **DR.D.KAVITHA M.D.,** Post graduate student of Pediatric Medicine, Coimbatore Medical College & Hospital, Coimbatore – 18 during the academic year 2013 – 2016.

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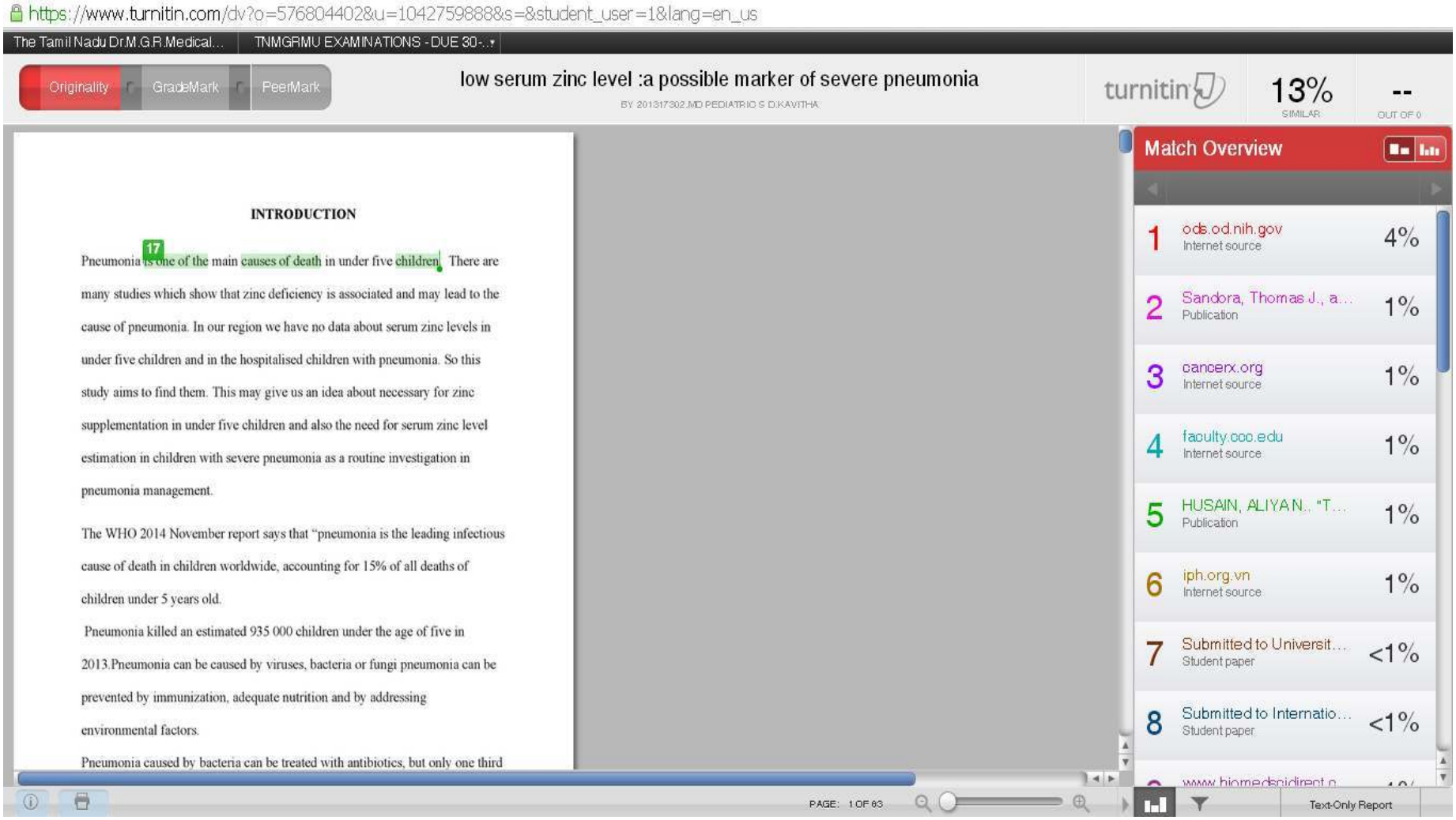
INTRODUCTION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INTRODUCTION
Pneumonia is one of the main causes of death in under five children. There are many studies which show that zinc deficiency is associated and may lead to the cause of pneumonia. In our region we have no data about serum zinc levels in under five children and in the hospitalised children with pneumonia. So this study aims to find them. This may give us an idea about necessary for zinc supplementation in under five children and also the need for serum zinc level estimation in children with severe pneumonia as a routine investigation in pneumonia management.
The WHO 2014 November report says that "pneumonia is the leading infectious cause of death in children worldwide, accounting for 15% of all deaths of children under 5 years old.
Pneumonia killed an estimated 935 000 children under the age of five in 2013.Pneumonia can be caused by viruses, bacteria or fungi pneumonia can be prevented by immunization, adequate nutrition and by addressing environmental factors.
Pneumonia caused by bacteria can be treated with antibiotics, but only one third
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DECLARATION

I Declare that this dissertation entitled " **LOW SERUM ZINC LEVEL –POSSIBLE MARKER OF SEVERE PNEUMONIA "** has been conducted by me under the guidance and supervision of my guide **Prof.Dr.V.Suganthi, M.D., DCH.** It is submitted in part of fulfillment of the award of the degree of MD Pediatrics for the April 2016 examination to be held under The Tamilnadu Dr.M.G.R Medical University, Chennai. This has not been submitted previously by me for the award of any degree or diploma from any other university.

DATE :

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DR. D.KAVITHA

TABLE OF CONTENTS

ABBREVIATION

WHO	-	World Health Organisation
FAO	-	Food and Agricultural organisation

ABSTRACT

BACKGROUND

Pneumonia is the leading cause of mortality in under five children. Studies show zinc deficiency is associated with pneumonia.

OBJECTIVE

We aimed to study the relationship between the serum zinc level and severe pneumonia.

PATIENTS AND METHODS

A case control study was conducted at the Coimbatore medical college, in the Pediatric department in 6 to 60 months old children. Fifty children with severe pneumonia and fifty children as controls matched with age, sex and nutrition were included.

RESULTS

80 percent of children with severe pneumonia had low serum zinc levels while 20 percent of controls only had low serum zinc levels.

CONCLUSION

We concluded that severe pneumonia is associated with lower serum zinc level and lower the serum zinc levels the higher the respiratory distress and lower the oxygen saturation. However large scale studies are needed in this field.

KEY WORDS

ZINC, CHILDREN, PNEUMONIA

INTRODUCTION

Pneumonia is one of the main causes of death in under five children. There are many studies which show that zinc deficiency is associated and may lead to the cause of pneumonia. In our region we have no data about serum zinc levels in under five children and in the hospitalised children with pneumonia. So this study aims to find them. This may give us an idea about necessary for zinc supplementation in under five children and also the need for serum zinc level estimation in children with severe pneumonia as a routine investigation in pneumonia management.

The WHO 2014 November report says that "pneumonia is the leading infectious cause of death in children worldwide, accounting for 15% of all deaths of children under 5 years old.

Pneumonia killed an estimated 935 000 children under the age of five in 2013.Pneumonia can be caused by viruses, bacteria or fungi pneumonia can be prevented by immunization, adequate nutrition and by addressing environmental factors.

Pneumonia caused by bacteria can be treated with antibiotics, but only one third of children with pneumonia receive the antibiotics they need

Pneumonia is a form of acute respiratory infection that affects the lungs. The lungs are made up of small sacs called alveoli, which fill with air when a healthy person breathes. When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits oxygen intake.

Pneumonia is the single largest infectious cause of death in children worldwide. Pneumonia killed an estimated 935 000 children under the age of five in 2013, accounting for 15% of all deaths of children under five years old. Pneumonia affects children and families everywhere, but is most prevalent in South Asia and sub-Saharan Africa. Children can be protected from pneumonia, it can be prevented with simple interventions, and treated with low-cost, low-tech medication and care Zinc is an essential trace element required for maintaining intestinal cells, bone growth, and immune function. Children who are living in low-income settings are often undernourished and zinc deficient. Severe zinc deficiency has been

associated with stunting of growth, impaired immunity, skin disorders, learning disabilities and anorexia".

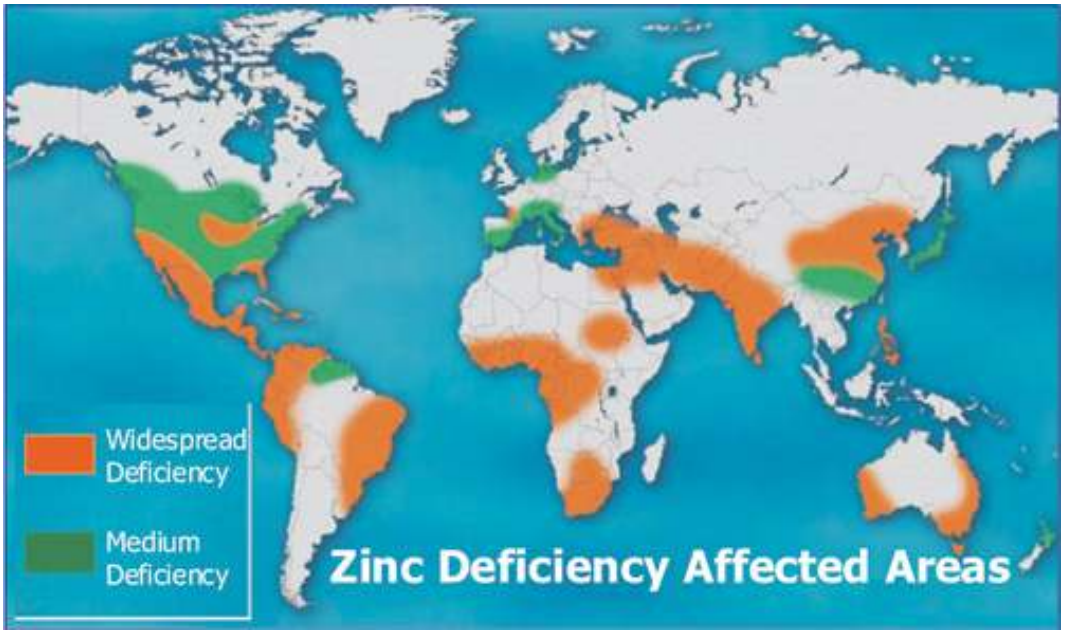
"Studies of zinc supplementation for the treatment or improved management of acute lower respiratory tract infections, including pneumonia have had mixed results. Zinc supplementation in combination with oral rehydration solution has already formed the basis of the WHO/UNICEF recommendation for use in the management of children with diarrhoea."

CAUSES OF ZINC DEFICIENCY

Though the zinc deficiency occurs due to various reasons, the need to correct is important as many studies show higher death rate with children affected with pneumonia is associated with low level of zinc.

It is obvious if we have data regarding prevalence of zinc deficiency it will be useful to treat that. Also the zinc content in soil is not the same throughout the world .so many factors are involved in zinc deficiency and its relevance with various diseases. The second most important among them is pneumonia.

The WHO has devised a multifactorial approach in management of pneumonia now for effective treatment zinc supplementation is also suggested. But deficiency status is essential for treatment of pneumonia, since only then adequate dose of zinc therapy can be instituted.



This picture shows that our country also comes in the area of wide spread zinc deficiency.

There are various studies supporting zinc supplementation in zinc deficient population which given in adequate doses prevents pneumonia. Also mortality associated with pneumonia can also be reduced by this effort.

There is no study detailing the level of zinc deficiency and severe pneumonia in our region.

This study aims at finding out the correlation between level of zinc with severe pneumonia.

This study might throw a light on need for prophylactic zinc supplementation in under five children and the need to estimate serum zinc level in children with pneumonia as a routine.

AIM OF THE STUDY

Aim of the study is to compare the serum zinc levels among children 6 months to 60 months of age hospitalised with severe pneumonia with the same age matched controls.

OBJECTIVE OF THE STUDY

1. To find serum zinc level in the hospitalised children 6 to 60 months of age with severe pneumonia
2. To find serum zinc levels in the age matched controls
3. To find the relationship between the serum zinc level and severe pneumonia

MATERIALS AND METHODS

- Patients 6 to 60 months admitted with severe pneumonia (both bronchopneumonia and lobar pneumonia) as per WHO criteria, with x-ray finding are selected. Serum zinc levels are estimated in them.

- Then age, sex and nutrition matched controls are selected from outpatient department and their serum zinc levels are estimated.

Then the relationship between serum zinc levels and severe pneumonia is studied.

INCLUSION CRITERIA FOR CASES:

- All hospitalized children 6 to 60 months of age with severe pneumonia as per WHO criteria, with x-ray changes(Both bronchopneumonia and lobar pneumonia)

EXCLUSION CRITERIA

- 1. Children with clinical features of congenital zinc deficiency
- 2. Patients with PEM grade III and IV (IAP classification)
- 3. Patients with clinical features suggestive of immunodeficiency.
- 4. Patients with acute diarrhoeal diseases.

- 5. Patients with hospital acquired pneumonia.
- 6. Children taking zinc containing supplements.

Inclusion criteria for controls

- Age matched healthy controls

Exclusion criteria for controls

- Children with clinical features of congenital zinc deficiency
- Children with PEM grade III and IV (IAP classification)
- Children taking zinc containing supplements

STUDY DESIGN

"This is a case control study conducted at the department of paediatrics, Coimbatore Medical College Hospital from July 2014-June2015".

Method of collection of data

- Sample size:
- Minimum of 50 cases and 50 controls are included for study.

Sample size calculation formula

Sample Size Calculation formula

" $n = t^2 \times p(1-p) / m^2$

Description:

n = required sample size

T = confidence level of 95%

p = Expected Frequency of the Factor under Study – 1.6%

M = margin of error of 5%

(Standard value of 0.05)

n = 97"

Contingency

"The sample is further increased by 5% to account for contingencies such as non-response or recording error.

n + 5% = 97 x 5% = 100 [BOTH GROUPS]

EACH GROUP - 50+ 50

CASE - 50 nos

CONTROL - 50 nos"

STUDY PROCEDURE

- All children included in this study are from lower socioeconomic class as per modified kuppusamy scale.
- Prior consent is obtained from parents of the children included in this study.
- Admitted patients included in the study are evaluated by taking detailed history as per the proforma attached.
- Blood sample is taken from them.
- Serum zinc levels are estimated using atomic absorption spectrometry.
- Their course in the hospital, duration of stay and their outcomes are noted.
- Age matched controls for the cases are selected from the paediatric outpatient department.
- Blood from them is tested for serum zinc levels by the same method.

Zinc estimation

For estimation of zinc 2 ml of blood collected using 22 gauge steel needle in a dry tube and allowed to be clotted and serum separates and then sent for processing or stored in 2 to 8 degree in refrigerator for maximum of 48 hours and sent to private lab for processing. The serum zinc level is estimated using Atomic absorption spectrometer.

Serum Zinc level – "cut off values"

"For males and females less than 10 years in south asian population is 65µg/dL.

Reference : Saeed Akhtar.Zinc status in south asian populations – an update.J Health popul nutr 2013 June;31(2):139-149".

Statistical analysis

"The qualitative variables as expressed in frequency and percentage.

A Chi Square test was used to assess differences in categoric variables between groups

Odds ratio was used to assess the variables.

A p value of <0.05 using a two tailed test was taken as being of significance for all statistical tests.

All data were analysed with a statistical software package(SPSS, version 16.0 for windows)”

REVIEW OF THE LITERATURE

Pneumonia defined as inflammation of the lung parenchyma, is the leading cause of death globally among children younger than age 5 yr, accounting for an estimated 1.2 million (18% total) deaths annually. The incidence of pneumonia 10 times more, and the childhood mortality due to this disease is two thousand times more. In the world three fourths of the deaths from pneumonia occurs in fifteen countries.

World scenario: throught the world the mortality from pneumonia is declined ny ninety seven percent. In 2007 , pneumonia accounted for 2% of all the deaths of children less than 5 years of age, than 9% at 1970. The reduction in the incidcence is mainly due to the invention of the newer antibiotics , good medical care and the vaccines.

Once the bacteria Haemophilus influenzae type b was the frequent aetology for the bacterial pneumonia in the young children .but after the use of the effective vaccine for this there is significant reduction of this disease.the measles vaccine reduced significant amount of deaths due to post measles pneumnia.the infrastructure in the rural and the remotes areas of the developing countries were improved and the access to the medical facilities were better in the developing countries like india.the

role of the two important vaccine like the pneumococcal conjucate vaccine and the flu vaccine is very important in reducing the pneumonia related deaths in the past years..

ETIOLOGY

Pneumonia is mainly caused by infectious agents. But other causes also there.

In many patients the cause of the pneumonia is very difficult to determine as it needs culture of the lung parenchyma which is very difficult to perform and also unnecessary in most of the occasions. the sputum samples and the samples obtained from the upper respiratory tract cant help to accurately find the infectious etiology. The modern molecular diagnostic methods help to find the etiological agent whether it is a bacteria or virus in the children with community acquired pneumonia.

AETIOLOGY

Infectious causes

viruses

Common

- Respiratory syncytial virus
- Parainfluenza types 1-3
- Influenzas A, B
- Adenovirus
- Human metapneumovirus

Uncommon

- Rhinovirus
- Enterovirus
- Herpes simplex
- Cytomegalovirus
- Measles
- Varicella
- Hantavirus
- Coronavirus

Severe acute respiratory syndrome (SARS),

Middle East respiratory syndrome [MERS]

BACTERIAL CAUSES

Common agents

- Streptococcus pneumonia
- H. influenzae type b
- Staphylococcus aureus
- Moraxellacatarrhalis
- Neisseriameningitidis
- Francisellatularensis
- Nocardia species
- Chlamydophila psittaci
- Yersinia pestis
- Legionella species
- Coxiella burnetii

FUNGAL INFECTIONS

- Histoplasma capsulatum
- Blastomyces dermatitidis
- Coccidioidesimmitis
- Cryptococcus neoformans
- Aspergillus species
- Mucormycosis
- Pneumocystis jiroveci

PARASITIC

- Ascaris
- Strongyloides species

The commonest cause of pneumonia in children less than four years is Streptococcus pneumonia. Mycoplasma pneumoniae and Chlamydophila pneumoniae are the most frequent bacterial pathogens in children age five years and above. In addition to pneumococcus the other bacterial causes of pneumonia in previously healthy children are group A streptococcus also known as Streptococcus pyogenes and Staphylococcus aureus. Staphylococcus aureus pneumonia is the common complication of

the influenza virus infection. The commonest infection causing morbidity and mortality in children of the developing countries are

1. Streptococcus pneumoniae
2. Hemophilous influenza
3. Staphylococcus aureus
4. In HIV infected patients - Mycobacterium tuberculosis, atypical mycobacteria Salmonella , Escherichia coli and Pneumocystis jiroveci

Aetiology of the causative organism based on the age

Age group	**Causative organism**
	Birth to three weeks
	Streptococci group B, E. coli
	Haemophilus influenza type b and non typeable
3 weeks to 3 months	Respiratory syncytial virus; rhinoviruses ; para influenzaviruses influenzaviruses adenovirus S. pneumoniae H. influenzae type b and nontypeable Chlamydia trachomatis in afebrile patients.

4 months to 4years	"Respiratory syncytial virus rhinoviruses influenza viruses adenovirus S. pneumoniae H. influenzae type b Mycoplasma pneumoniae group A streptococcus"
More than five years	"M.pneumoniae,S. pneumoniae, Chlamydophila pneumoniae, H. influenzae type b and nontypeable influenza viruses adenovirus other respiratory viruses Legionella pneumophila"

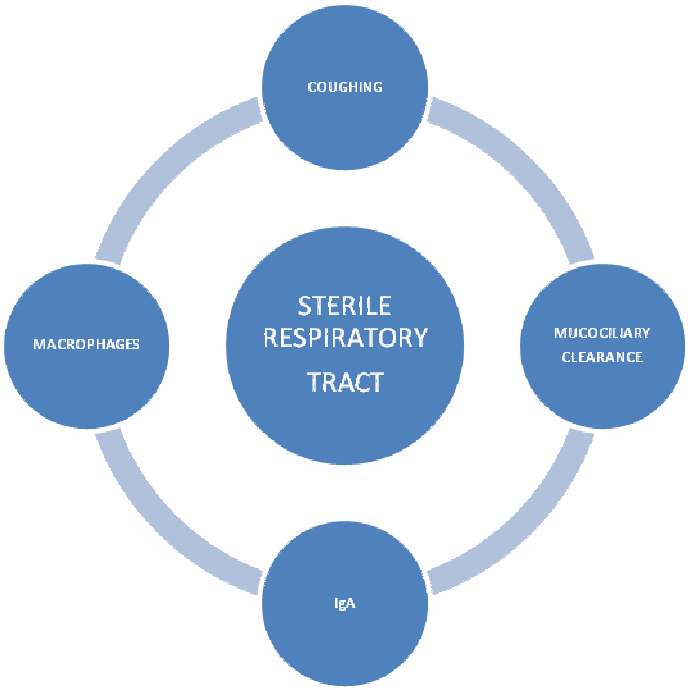
In the areas where routine immunization is implemented for H.influenzae and Pneumococci there is a reduction in the incidence of pneumonia noted.

Viruses are the most common organism responsible for the lower respiratory tract infections in infants and children above one month but below fiveyear of age. By using molecular diagnostic methods Viruses can be found in more than half of children with pneumonia. Among the respiratory viruses the respiratory syncytial virus and rhinoviruses are the most commonly identified mainly in children less than two year of age. However as the rhino viruses are often detected in asymptomatic children the role of rhinoviruses in severe lower respiratory tract infection remains poorly defined. Other common viruses causing pneumonia include influenza virus, adeno viruses parainfluenza viruses and enteroviruses

and human metapneumovirus. In about 20% of the patients with pneumonia more than one virus are isolated.In both the hemespheres of the earth the “lower respiratory tract infections are more common in the fall and winter in relation to the seasonal epidemics of respiratory viral infection that may occur each and every year. At the beginning of thee fall para influenza infections typically appear and most commonly start as croup. After that in winter Respiratory syncytial virus, human meta pneumovirus and then influenza viruses may cause upper respiratory tract infections and widespread infections including bronchiolitis and pneumonia. Respiratory syncytial virus is particularly very severe among infants and young children. But unlike that influenza virus causes more morbidity in the form of disease and excess hospital admissions for acute respiratory problems in all age groups”.

Immunization status should be known as children fully vaccinated against H. influenzae type b and Streptococcus pneumoniae are less likely to be infected with the above organisms. “Immune compromised children and those who have an underlying illness may be at risk for infection with specific pathogens. such as In patients with cystic fibrosis Pseudomonos species are the commonest organism causing lower respiratory tract infection”.

PATHOGENESIS



This is the mechanism of protection of our respiratory tract.

This is the mechanism of pathogenesis of viral pneumonia.

VIRAL PNEUMONIA		
DIRECT INJURY	AIRWAY OBSTRUCTION	SECONDARY BACTERIAL

MORPHOLOGY

Bacterial pneumonias have two types of anatomic distribution. One is lobular broncho pneumonia and the other is lobar pneumonia. In broncho pneumonia there is “patchy consolidation of the lung which is the dominant feature”. But in lobar pneumonia it is the consolidation of a large portion of a lobe and or of an entire lobe defines lobar pneumonia. But in practice these anatomic categorizations may be difficult to apply because patterns overlap.when the infection progresses the patchy involvement may become confluent. This produces almost total lobar consolidation. but with a highly effective antibiotic therapy that may limit involvement to a subtotal consolidation.sometimes the same organisms may produce any one of the two patterns depends on the susceptibility of the different patiens.the important thing in clinical standpoint are the identification of the bacteria which is causing the disease and to determine the extent of the disease.

Lobar pneumonia

Classically there are four stages of the inflammatory response

1. Congestion
2. red hepatization
3. gray hepatisation
4. resolution.

In the first stage, that is the stage of congestion the lungs are heavy, boggy, and red. This phase is characterized by engorgement of the vascular compartment and intra alveolar liquid with some neutrophils. Numerous bacteria were also present at this stage. In the next stage of red hepatization is characterized by massive confluent exudation. This is happen as neutrophils , red cells and fibrin fill the alveolar spaces. On examination the lobe is red firm and may have no air. It may have a liver like consistency. Because of that it is called as hepatization. The next stage that follows is of gray hepatisation.this stage is marked by progressive disintegration of red cells. Also there is the persistence of a fibrinosuppurative exudate and it undergoes organization. This may leave fibrous thickening or permanent adhesions.the lesions of broncho pneumonia are consolidated areas of acute suppurative

inflammation. this may be confined to one lobe. Sometime it is more often multi lobar. Some times it is frequently bilateral and basal because of the tendency of secretions to gravitate to the lower lobes. Well developed lesions are slightly elevated and dry and granular. They are also gray red to yellow and poorly delimited at their margins. Histologically the reaction usually elicits a neutrophil rich exudate that fills the bronchi bronchioles and adjacent alveolar spaces. Pleural fibrinous reaction to the underlying inflammation, often present in the early stages if the consolidation extends to the surface and may resolve.The complications of pneumonia are

1) tissue destruction and necrosis, causing abscess formation.these complications are very common with pneumococci type 3 and Klebsiella

2) spread of infection to the pleural cavity and that may lead to the intra pleural fibrino suppurative reaction known. This is known as empyema

3) dissemination of the bacteria through the blood to the heart valves pericardium brain kidneys spleen and joints. This spread

may cause metastatic abscesses, endocarditis, meningitis and suppurative arthritis.

RECURRENTPNEUMONIA

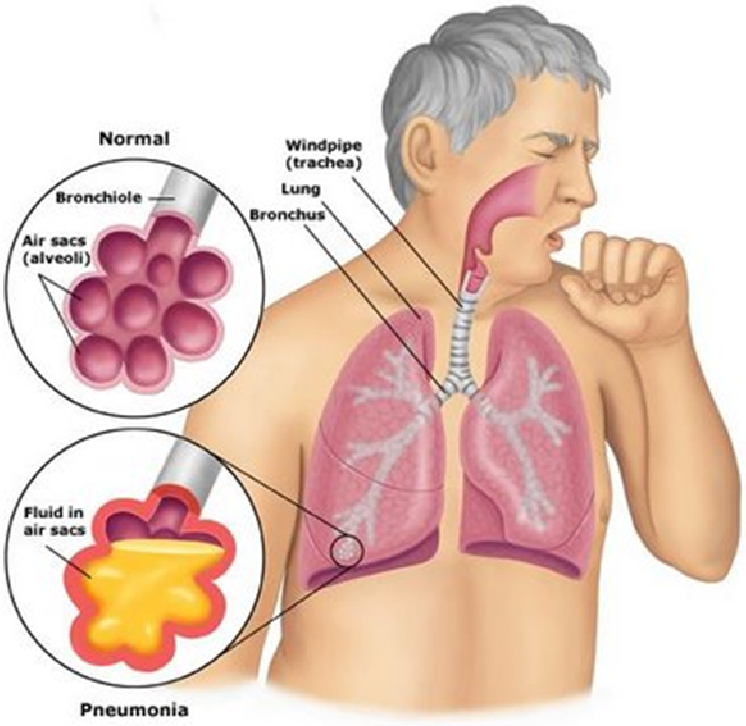
The definition of the recurrent pneumonia is

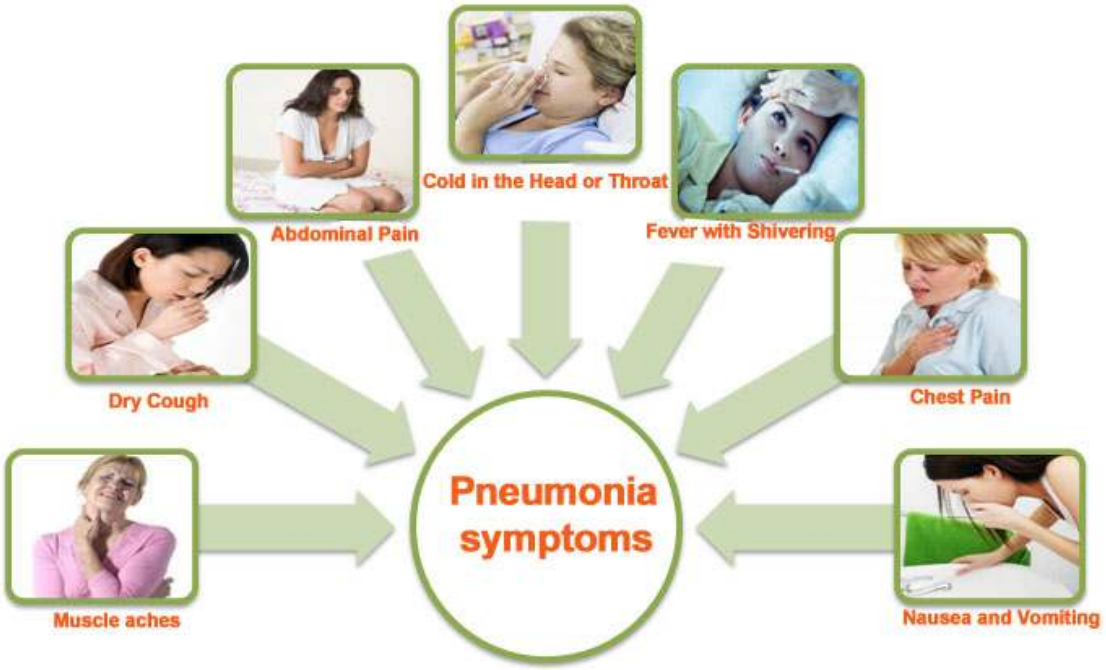
- 2 or more episodes in a single year or
- 3 or more episodes ever

There should be clearance of the radiological lesions inbetween the episodes.

CLINICAL MANIFESTATIONS

Pneumonia is frequently starts with non specific repiratory symptoms .


Normal
Bronchiole
Air sacs (alveoli)
Windpipe (trachea)
Lung
Bronchus
Fluid in air sacs
Pneumonia


Abdominal Pain
Cold in the Head or Throat
Fever with Shivering
Dry Cough
Chest Pain
Pneumonia symptoms
Muscle aches
Nausea and Vomiting

DIAGNOSIS

The diagnosis needs the presence of an infiltrate on chest Xray. The Xray may also detect the complications of the pneumonia .The characteristic feature of the viral pneumonia usually is hyperinflation with bilateral interstitial infiltrates and peri bronchial cuffing. Pneumococcal pneumonia is typically associated with confluent lobar consolidation. “The radiographic features alone are not diagnostic.The other clinical features also should be considered for the diagnosis . In the patients with uncomplicated pneumonia Repeat chest radiographs are not required for proof of cure. Many experts advised that a chest radiograph may not be necessary for older children with suspected pneumonia. cough, fever, localized crackles, or decreased breath sounds who are well enough to be managed as outpatients.

The use of portable or handheld ultrasonography is highly sensitive and specific for the diagnosis of the pneumonia in children. This is by findins consolidations of the lung and air bronchograms or pleural effusions.

The differentiation from viral and bacterial pneumonia can be made by total leucocyte counts.The total leucocyte count can be normal or elevated in viral pneumonia. But it is usually less than 20,000. There

may be a lymphocyte predominant picture. In bacterial pneumonia there is a very high total leucocyte count. This is usually in the range of 15,000- 40,000/mm3. There is a predominant granulocytes. The bacterial etiological cause is suggested by the presence of a large pleural effusion and lobar consolidation. There may be a high fever at the onset of the illness. Atypical pneumonia caused by Chlamydia pneumoniae or Mycoplasma pneumoniae is difficult to differentiate from pneumococcal pneumonia based on the radiographic and laboratory findings. Although pneumococcal pneumonia is associated with a higher total leucocyte count, erythrocyte sedimentation rate, procalcitonin, and C-reactive protein level. There is considerable overlap especially with adenoviruses and enteroviruses".

In the viral infections the gold standard confirmative investigations are

- the isolation of a virus or
- detection of the viral genome or
- antigen in respiratory tract secretions.

For the rapid detection of many respiratory micro organisms such as Mycoplasma Pertussis, and many viruses including Respiratory syncytial viruses parainfluenza viruses influenza viruses and

adenoviruses there are many reliable and accurate deoxyribo nucleic acid or ribonucleic acid tests available.

“Serologic techniques can also be used to diagnose a recent respiratory viral infection.but they usually require testing of acute and convalescent serum samples.In those samples there may be a rise in antibodies to a specific viral agent. This diagnostic technique is laborious and slow.Also they are clinically not very useful. By the time it is confirmed serologically the infection usually resolves.

Serologic testing may be valuable as an epidemiologic tool to estimate the incidence and prevalence of the many types of respiratory tract viral micro organisms. Determination of the peripheral cell gene expression pattern by microarray reverse transcription polymerase chain reaction is an emerging technology. This technique may help to differentiate viral pneumonia from bacterial causes of pneumonia.

The gold standard and the definitive diagnosis of a bacterial infection needs isolation of an organism from the blood or the pleural fluid or from the lung. Sputum culture is not of significant value in the diagnosis of pneumonia in very young children.

The percutaneous aspiration of the lung is invasive. Also it is not routinely performed. Blood culture results are positive only in ten

percent of children the with pneumococcal pneumonia". Blood cultures were not recommended routinely for non toxic appearing children treated as an outpatient. Blood cultures are only recommended for those who fail to improve and have clinical deterioration and in those with complicated pneumonia . also blood culure is recommended for those requiring hospital admission.

Cold agglutinins in a titers more than 1: 64 are detected in the serum in about fifty percent of patients with Mycoplasma pneumoniae infections. Cold agglutinin titers were nonspecific. The other pathogenic organisms such as influenza viruses may also cause elevated cold agglutinin titres.

Acute infection caused by M. pneumoniae can be diagnosed on the basis of the following

1. a positive polymerase chain reaction test result or
2. seroconversion in an IgG assay.

For the diagnosis of the group A streptococcal pneumonia serologic evidence like the anti streptolysin O titer (ASO) may be very useful .

Indications for admission in the hospital in Children with Pneumonia

- less than six month of age
- Sickle cell disease with features of acute chest syndrome
- Involvement of multiple lobes of the lung
- Immuno deficiency state
- Toxic appearance
- Complicated pneumonia
    - ❖ Pleural effusion
    - ❖ Empyema
    - ❖ acute respiratory distress syndrome
    - ❖ extrapulmonary infection like central nervous system infection, pericarditis,endocarditis and osteomyelitis
    - ❖ hemolytic uremic syndrome
    - ❖ sepsis
- "Moderate to severe respiratory distress
- Requirement oxygen supplement
- Dehydration
- Vomiting or inability to tolerate oral fluids or medications

- No response to appropriate oral antibiotic therapy
- Social factors”

TREATMENT

Treatment of presumed bacterial pneumonia is based on the suspected cause and the age and clinical appearance of the child. Amoycillin is the recommended medicine for the less toxic children in whom there desnt need hospital admission. As there is emerging increase in the strains of penicillin resistance high doses of amoxicillin ie 80 to 90 mgper kilogram per day should be prescribed. The other alternative medications are include Cefuroxime axetil and amoxicillin clavulanic acid.

An antibiotic like Azithromycin or Clarithromycin is recommended for

- School age children and
- in children in whom infection with Mycoplasma pneumoniae and Chylamydia pneumoniae is.

The broad spectram respiratory quinol;ones like levofloxacin or moxifloxacin are considered as an alternatives in adolescents.in the developing countries there are many factors which prevent the medical

management. There only about sixty percent of children with symptoms of pneumonia were taken to an appropriate caregiver. And among them only less than 1/3 only receive appropriate antibiotics.

"The World Health Organization and other international groups have developed systems.this system train the mothers and local area healthcare providers in the recognition and treat- ment of pneumonia. In India it is called as IMNCI guidelines which is followed in the local health care system".

The empirical treatment of suspected bacterial pneumonia

Ampicillin or penicillin G

- in areas without substantial high-level penicillin resistance among S. pneumoniae,
- children who are fully immunized against H. influenzae type b and S. pneumonia
- who are not severely ill

ceftriaxone or cefotaxime

- for children who do not meet these criteria

Vancomycin or Clindamycin

- if clinical features suggest staphylococcal pneumonia like pneumatoceles or empyema

No antibiotics

- If viral pneumonia is suspected especially for those patients who are mildly ill
- are in no respiratory distress.

However “about thirty percent of patients with known viral infection especially influenza viruses may have coexisting bacterial pathogens. Hence if the decision is made to withhold antibiotic therapy on the basis of presumptive diagnosis of a viral infection, deterioration in clinical status should signal the possibility of superimposed bacterial infection”. In the above clinical situation antibiotic therapy should be initiated.

Duration of antibiotics

The “optimal and exact duration of antibiotic treatment for pneumonia has not been established well in controlled studies.

However, antibiotics should generally be continued until

- the patient has been afebrile for 72 hr and
- the total duration should not be less than 10 days or
- 5 days if azithromycin is used
- Shorter courses 5to7 days may also be effective particularly for children managed on an outpatient.

Available data do not support prolonged courses of treatment for uncomplicated pneumonia. In developing countries like India the supplementation oforal zinc 10 mg per day for less than 12 mo old infants and 20 mg per day for more than12 month old children reduces mortality among children with severe pneumonia".

PROGNOSIS

Within two to four days of starting the antibiotics uncomplicated community acquired pneumonia shows good response to treatment. There will be improvement of fever cough tachypnea and chest pain. Radiological evidence of improvement trails substantially behind clinical improvement.

When a patient did not improve with appropriate antibiotic therapy the following may be considered

- complications like empyema
- bacterial resistance
- nonbacterial etiologies like viruse fungus and aspirations
- bronchial obstruction from endobronchial lesions and foreign body and mucous plugs
- immunocompromised states and cystic fibrosis
- pulmonary sequestration
- congenital pulmonary airway malformation
- “non infectious causes
  - bronchiolitis obliterans
  - hypersensitivity pneumonitis
  - eosinophilic pneumonia
  - aspiration
  - granulomatosis with polyangiitis
  -

A repeat chest radiograph is the first step in determining the reason for delay in response to treatment. Broncho alveolar lavage may be indicated in children with respiratory failure; high-resolution CT scans may better identify complications or an ana- tomic reason for a poor response to therapy.

Mortality from community-acquired pneumonia in developed nations is rare, and most children with pneumonia do not experience long-term pulmonary sequelae. Some data suggest that up to 45% of children have symptoms of asthma 5 yr after hospitalization for pneu- monia; this finding may reflect either undiagnosed asthma at the time of presentation or a propensity for development of asthma after pneumonia".

COMPLICATIONS

The spread of the bacterial infection by directly into the thoracic cavity or spread through the blood and the presence of the bacteria in the blood stream is responsible for the complications of pneumonia . the direct spread causes empyema, pleural effusion and pericarditis.

- Hemophilous influenza type b causes meningitis, arthritis, osteomyelitis
- Staphylococcus aureus, Streptococcus pneumoniae and Streptococcus causes para pneumonic effusions , empyema

Many of the effusions followed the bacterial pneumonia were sterile. Even htough if the culture is negative the bacterial genome may be identified by the universal RNA gene polymerase chain reaction and can determine the bacterial etiology of the pleural effusion.

Treatment of the empyema

It is based on the stage of the empyema whether exudative or fibrino purulent or organizing.

The stage of the empyema may be identified by the computed tomographic scan or by ultrasonogram. The main treatment for empyema area antibiotic therapy with chest tube drainage. The other treatments are the useage of intrapleural fibrinolytic therapy. The agents used are tissue plasminogen activator,streptokinase or urokinase.For the debridement of the adhesions and for the lysis of the lesions selected video assisted thoracoscopy may be used. This also help todrain the pus which is loculated. Thoracotomy and open debridementmay not be needed if there is prompt early diagnosis and management,especially with fibrinolysis and sometimes videoassisted thoracoscopy.among these two fibrinolysis is less costlier than video assisted thoracoscopy.

PREVENTION

The invention of the vaccines and the extensive vaccinations grossly reduced the incidence of the pneumonia hospital admissions. The seven valent conjugate vaccine for pneumococcus was introduced in the early twentieth century. Following that there is almost thirty percent reduction in the occurrence of the pneumonia patients.

Ten years after the introduction of the hepta valent vaccine the thirteen valent vaccine was introduced. This vaccine will further reduced the incidence of the pneumococcal disease. This vaccine has more strains which are not covered by the heptavalent vaccine.

The difference between transudate and empyema are shown below:

	TRANSUDATE	**EMPYEMA**
Appearance	Clear	Cloudy or purulent
Cell count	Less than1,000	Often>50,000
Cellular type	Lymphocyte	neutrophils
LDH	Less than 200 U/L	>2/3 of the upper limit of normal for serum LDH
Pleural fluid: serum LDH ratio	Less than 0.6	More than 0.6
Protein more than 3 gram	Rare	Common
Pleural fluid:serum protein ratio	Less than 0.5	More than 0.5
Glucose level	Normal	Low less than40 mg per ml
pH	Normal 7.4 to7.6	Less than 7.1
Gram staining	Negative	Sometimes positive
Cholesterol		More than 55 mg per ml

ZINC

Zinc is an “essential mineral that is naturally present in some foods, added to others and also available as a dietary supplement.

Zinc is involved in many aspects of metabolism”of the human cells. It is necessary for the catalytic activity of more than three hundred enzymes. Also it plays a very important role in the immune functions of the human body and has many roles in protein synthesis and wound healing. Also it is very important in the process DNA synthesis and in cell division. Zinc also helps the normal growth and development at and during pregnancy and childhood adolescence and adults . It is required for the special sense organs like tongue and the nose for taste and smell. As there is no separate storage system for zinc in our body. Hence daily intake of zinc is required to maintain a steady state in our body functions.

Daily recommended intake

The recommendations for intake of zinc are given inthe Dietary Reference Intakes developed by the Food and Nutrition Board at the Institute of Medicine of the National Academies.

These values different for different age and gender are

- Recommended Dietary Allowance (RDA): average daily level of intake sufficient to meet the nutrient requirements of nearly all (97%–98%) healthy individuals.

- Adequate Intake (AI): established when evidence is insufficient to develop an RDA and is set at a level assumed to ensure nutritional adequacy.

- Tolerable Upper Intake Level (UL): maximum daily intake unlikely to cause adverse health effects [2].

The current RDAs for zinc are listed in Table 1 [2]. For infants aged 0 to 6 months, the FNB established an AI for zinc that is equivalent to the mean intake of zinc in healthy, breastfed infants.

"Recommended Dietary Allowances for Zinc

Age groups	Male Pregnancy	Female Lactation
Birth to six months	2 mg*	2 mg*
7–12 months	3 mg	3 mg
1–3 years	3 mg	3 mg
4–8 years	5 mg	5 mg
9–13 years	8 mg	8 mg
14–18 years	11 mg	9 mg 12 mg13 mg
19+ years	11 mg	8 mg 11 mg12 mg

* Adequate Intake (AI)"

Food sources of zinc

Zinc is present in many varieties of food. Chicken and the meat are the main source of zinc in the world diet. In terms of the serving Oysters contain more zinc.the following are the major food sources

- Beans
- Nuts
- certain types of seafood like crab and lobster

- whole grains
- fortified breakfast cereals
- dairy products

The phytates may bind zinc and inhibit the absorption of zinc in the food. They were present in whole grain breads, cereals, legumes. Hence "the bioavailability of zinc from grains and plant foods is lower than that from animal foods. But still many grain and plant based foods are still good sources of zinc.

Dietary supplements

Dietary Supplements contain different forms of zinc. They are zinc gluconate zinc sulfate and acetate. Each differs in percentage of elemental zinc varies by form. Approximately 23% of zinc sulfate consists of elemental zinc".

VEG FOOD ITEMS WHICH IS HIGH IN ZINC

These are the food materials of vegetable origin which have hiwgh zinc content.

NON VEG FOOD ITEMS

The above food items are of animal origin which are rich source of zinc.

There is very less scientific evidence to determine if any differences exist among the different forms of zinc in absorption, bioavailability or tolerability.

Sources other than diet

Zinc is present in several products like homeopathic medications which sold over the counter for the cure and prevention of colds.

Zinc is also present in some denture adhesive creams. The levels range from 17–34 mg per gram. chronic, excessive use can lead to zinc toxicity. Also this is resulting in copper deficiency and also neurological disease. Many denture creams have now been reformulated to eliminate zinc.

Zinc Deficiency

Zinc deficiency causes

- “growth retardation
- loss of appetite
- impaired immune function
- hair loss
- diarrhea
- delayed sexual maturation

- impotence
- hypogonadism in males
- eye and skin lesions
- Weight loss
- delayed healing of wounds
- taste abnormalities
- mental lethargy

Many of these symptoms are not specific and associated with other health conditions. So a medical evaluation is necessary to find whether a zinc deficiency is present.

The Zinc nutritional status is difficult to estimate correctly using laboratory tests". Because zinc is distributed as a component of various proteins and nucleic acids. Plasma or serum zinc levels are the most commonly used indices for evaluating zinc deficiency. But these levels do not necessarily reflect cellular zinc status because of the tight homeostatic control mechanisms.

Clinical effects of zinc deficiency can be present with normal laboratory values. Physicians should consider risk factors like inadequate caloric intake, alcoholism and gastrointestinal diseases and

symptoms of zinc deficiency when determining the need for zinc supplementation.

People with gastrointestinal and other diseases

- Gastrointestinal surgery
- digestive disorders like ulcerative colitis, Crohn's disease
- short bowel syndrome These can reduce zinc absorption and also increase endogenous zinc losses
- malabsorption syndrome,
- chronic liver disease
- chronic renal disease
- sickle cell disease, diabetes
- malignancy
- other chronic illnesses
- Chronic diarrhea also leads to excessive loss of zinc

Vegetarian diet

"The bioavailability of zinc from vegetarian diets usually is less than from non vegetarian diets. Because vegetarians do not eat meat which is high in bioavailable zinc and also will increase zinc absorption. Also vegetarians mainly eat high levels of legumes and whole grains.

These food contain high level of phytates . Phytates bind zinc and inhibit its absorption. So Vegetarians often require as much as fifty percent more of the RDA for zinc than non-vegetarians.

There are some techniques which that reduce the binding of zinc by phytates and increase its bioavailability.

Techniques to increase zinc bioavailability include

1) soaking beans, grains, and seeds in water for several hours before cooking them and allowing them to sit after soaking until sprouts form

2) by consuming more leavened grain products such as bread than unleavened products like crackers.

Leavening partially breaks down the phytate. So the body absorbs more zinc from leavened grains than unleavened grains".

Pregnancy and lactation

Pregnant women especially become pregnant with marginal zinc status were at increased risk of becoming zinc insufficient. This is due in part to high fetal requirements for zinc. Lactation can also deplete maternal zinc stores. Hence the RDA for zinc is higher for pregnant and lactating women than for other women

Older infants on exclusive breast feeding

Breast milk provides sufficient zinc for the baby for the first four to six months of life. But it do not provide recommended amounts of zinc for infants in the second half of the first year. The zinc requirements in the first six months is 2 mg per day whereas in the second half it will be 3 mg per day. Zinc supplementation has improved the growth rate. Some children who demonstrate mild to moderate growth failure and who have a zinc deficiency showed good improvement.

People with sickle cell disease

Many patients with sickle cell anemia usually have zinc deficiency. In these children zinc supplementation will improve the growth.

Alcoholism

"Half of the alcoholics have low zinc status. Because ethanol consumption decreases intestinal absorption of zinc. Also it increases urinary zinc excretion. Also the variety and amount of food consumed by many alcoholics is very limited and leading to inadequate zinc intake".

BIOLOGICAL ROLE OF ZINC

"Immune function

Severe zinc deficiency reduces immune function. Even mild to moderate degrees of zinc deficiency may impair macrophage and neutrophil functions and natural killer cell activity". Also there is impairment of the complement activity . For the development and activation T-lymphocytes The body requires zinc .The "persons with low zinc levels have shown reduced lymphocyte proliferation response to mitogens. Also they have other adverse alterations in immunity. They can be corrected by zinc supplementation". This is the probable explanation for the increased susceptibility for the infections like pneumonia in children of the developing countries like India who have low zinc status.

Wound healing

The integrity of skin and mucosal membranes is maintained by zinc. chronic leg ulcer patients may have abnormal zinc metabolism. They also have low serum zinc levels. Physicians frequently treat skin ulcers with zinc supplements. In a systematic review concluded that zinc sulfate might be effective for treating leg ulcers in some patients with low serum zinc levels.

Diarrhoeal disorders

"Acute diarrhea disorders are associated with high rates of mortality among children in developing countries. The Zinc deficiency causes changes in immune response which probably responsible for the increased susceptibility to infections. This is the basis of Zinc supplementation in children with diarrhoea.

Many Studies show that poor, malnourished children in India and other developing countries may experience shorter courses of infectious diarrhea following zinc supplements. The children in these studies received 4 to 40 mg of zinc per day in the form of either zinc acetate, zinc gluconate or zinc sulfate

The results from a pooled analysis of randomized controlled trial of zinc supplementation in developing countries states that zinc helps reduce the duration and severity of diarrhea in zinc-deficient or otherwise malnourished children .

Similar findings are reported in a meta-analysis published in 2008 and a 2007 review of zinc supplementation for preventing and treating diarrhea .The effects of zinc supplementation on diarrhea in children with adequate zinc status, such as most children in the developed countries like United States were not clear.

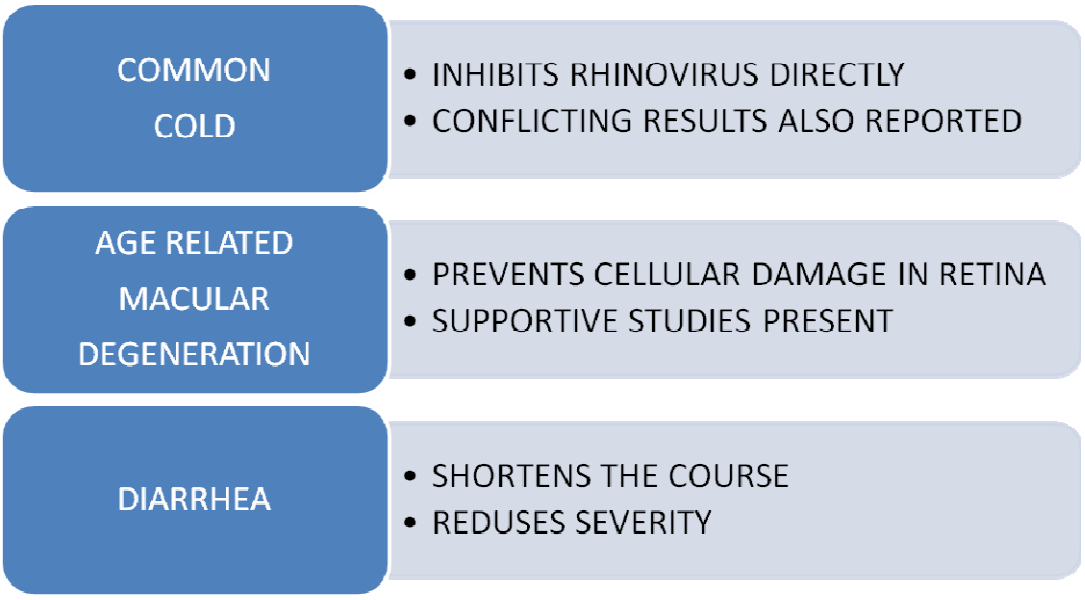
The World Health Organization and UNICEF now recommends a short course of zinc supplementation to treat acute childhood diarrhea".

WHO recommendations

For infants less than 6 months 10 mg per day.

For more than six months 20 mg per day.

This should be given for a period of 10 to 14 days.



"Interactions with iron and copper

Iron-deficiency anemia is a serious world-wide public health problem. Iron fortification programs have been credited with improving the iron status of millions of women, infants, and children. Fortification of foods with iron does not significantly affect zinc absorption. However,

large amounts of supplemental iron (greater than 25 mg) might decrease zinc absorption [2,78]. Taking iron supplements between meals helps decrease its effect on zinc absorption [78].

High zinc intakes can inhibit copper absorption, sometimes producing copper deficiency and associated anemia [79,80]. For this reason, dietary supplement formulations containing high levels of zinc, such as the one used in the AREDS study [72], sometimes contain copper.

Health Risks from Excessive Zinc

Zinc toxicity can occur in both acute and chronic forms. Acute adverse effects of high zinc intake include nausea, vomiting, loss of appetite, abdominal cramps, diarrhea, and headaches [2]. One case report cited severe nausea and vomiting within 30 minutes of ingesting 4 g of zinc gluconate (570 mg elemental zinc) [81]. Intakes of 150–450 mg of zinc per day have been associated with such chronic effects as low copper status, altered iron function, reduced immune function, and reduced levels of high-density lipoproteins [82]. Reductions in a copper-containing enzyme, a marker of copper status, have been reported with even moderately high zinc intakes of approximately 60 mg/day for up to 10 weeks [2]. The doses of zinc used in the AREDS study (80 mg per day of

zinc in the form of zinc oxide for 6.3 years, on average) have been associated with a significant increase in hospitalizations for genitourinary causes, raising the possibility that chronically high intakes of zinc adversely affect some aspects of urinary physiology [83].

The FNB has established ULs for zinc (Table 3). Long-term intakes above the UL increase the risk of adverse health effects [2]. The ULs do not apply to individuals receiving zinc for medical treatment, but such individuals should be under the care of a physician who monitors them for adverse health effects.

Table 3: Tolerable Upper Intake Levels (ULs) for Zinc [2]

Age	Male	Female	Pregnant	Locating
0–6 months	4 mg	4 mg		
7–12 months	5 mg	5 mg		
1–3 years	7 mg	7 mg		
4–8 years	12 mg	12 mg		
9–13 years	23 mg	23 mg		
14–18 years	34 mg	34 mg	34 mg	34 mg
19+ years	40 mg	40 mg	40 mg	40 mg

Interactions with Medications

Zinc supplements have the potential to interact with several types of medications. A few examples are provided below. Individuals taking these medications on a regular basis should discuss their zinc intakes with their healthcare providers".

Antibiotics

Both quinolone antibiotics (such as Cipro®) and tetracycline antibiotics (such as Achromycin® and Sumycin®) interact with zinc in the gastrointestinal tract, inhibiting the absorption of both zinc and the antibiotic [84,85]. Taking the antibiotic at least 2 hours before or 4–6 hours after taking a zinc supplement minimizes this interaction [86].

Penicillamine

Zinc can reduce the absorption and action of penicillamine, a drug used to treat rheumatoid arthritis [87]. To minimize this interaction, individuals should take zinc supplements at least 2 hours before or after taking penicillamine [85].

Diuretics

Thiazide diuretics such as chlorthalidone (Hygroton®) and hydrochlorothiazide (Esidrix® and HydroDIURIL®) increase urinary zinc excretion by as much as 60% [88]. Prolonged use of thiazide diuretics could deplete zinc tissue levels, so clinicians should monitor zinc status in patients taking these medications.

Zinc and Healthful Diets

The federal government's 2010 Dietary Guidelines for Americans notes that “nutrients should come primarily from foods. Foods in nutrient-dense, mostly intact forms contain not only the essential vitamins and minerals that are often contained in nutrient supplements, but also dietary fiber and other naturally occurring substances that may have positive health effects. ...Dietary supplements...may be advantageous in specific situations to increase intake of a specific vitamin or mineral”.

For more information about building a healthful diet, refer to the Dietary Guidelines for Americans and the U.S. Department of Agriculture's food guidance system, MyPlate .

The Dietary Guidelines for Americans describes a healthy diet as one that:

- Emphasizes a variety of fruits, vegetables, whole grains, and fat-free or low-fat milk and milk products.

Whole grains and milk products are good sources of zinc. Many ready-to-eat breakfast cereals are fortified with zinc.

- Includes lean meats, poultry, fish, beans, eggs, and nuts.

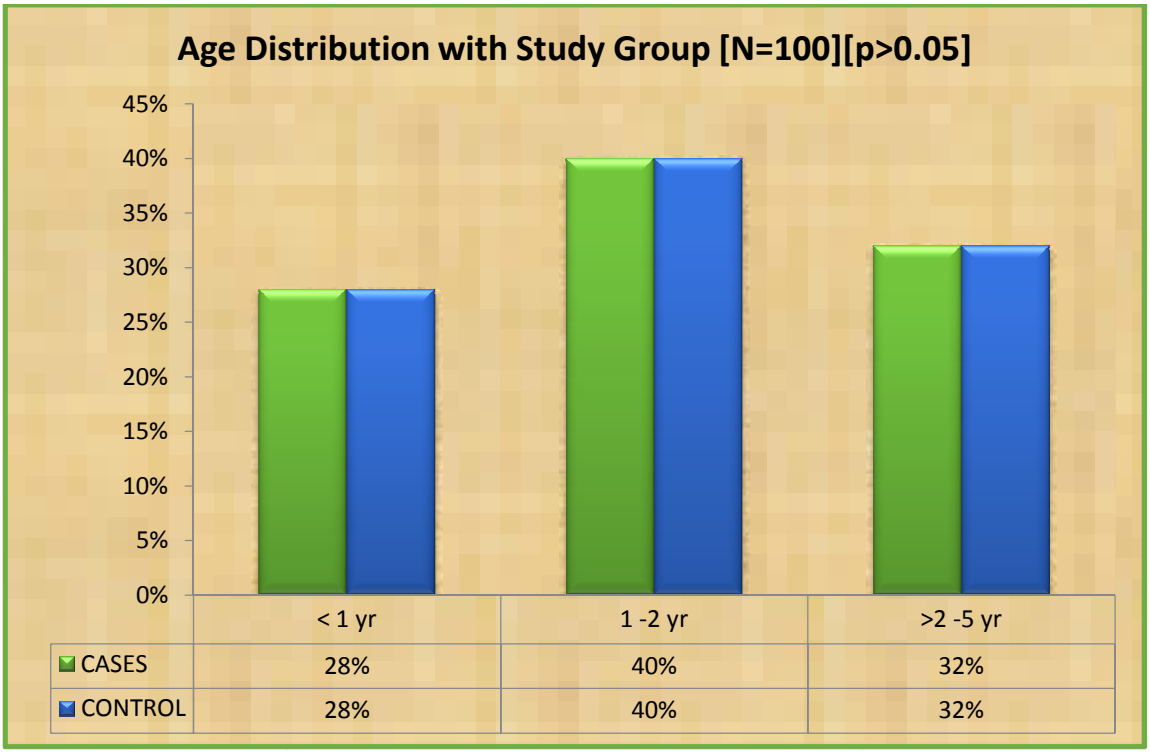
Oysters, red meat, and poultry are excellent sources of zinc. Baked beans, chickpeas, and nuts (such as cashews and almonds) also contain zinc".

RESULTS AND ANALYSIS

AGE DISTRIBUTION

AGE	GENDER		TOTAL	(%)
	MALE	FEMALE		
< 1 yr	16	12	28	28%
1 -2 yr	22	18	40	40%
>2 -5 yr	14	18	32	32%
TOTAL	52	48	100	

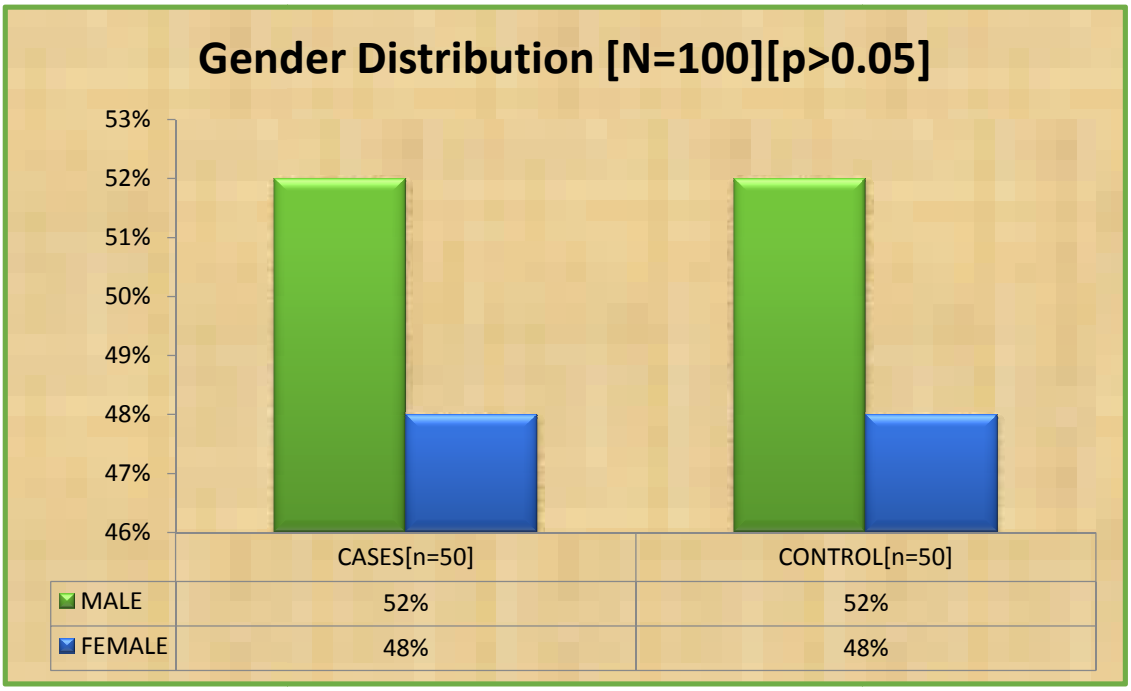
28% of study population is less than one year and 40% is between one to two years. So a total of 68% 0f study population is below 2 years. Only 32 persent is more than 2 years and less than 5 years.



SEX DISTRIBUTION

GENDER	STUDYGROUP		TOTAL	(%)
	CASES	CONTROL		
MALE	26	26	52	52%
FEMALE	24	24	48	48%
TOTAL	50	50	100	

In this study group 52 are male and 48 are female. There is no statistial significance in sex distribution.



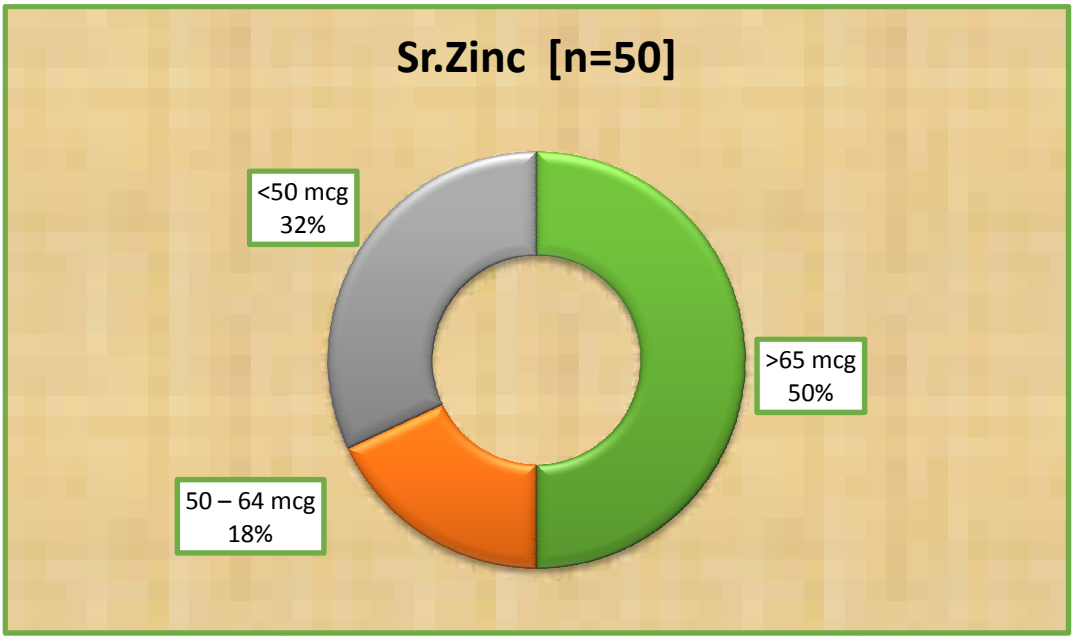
SERUM ZINC

Sr.Zinc	n
>65 mcg	50
50 – 64 mcg	18
<50 mcg	32
Total	100

In this study group of 100 children 50 children had serum zinc levels above 65mcg/dl and 50 children below this cut off.

Among the cases 40 children had serum zinc levels below 65mcg/dl and 10 children above 65mcg/dl.

Among the controls 40 children had serum zinc levels above 65mcg/dl and 10 children below 65mcg/dl



SERUM ZINC LEVEL IN STUDY GROUP

Sr.Zinc	STUDY GROUP		TOTAL	(%)
	CASES	CONTROL		
LOW	40	10	50	50%
NORMAL	10	40	50	50%
TOTAL	50	50	100	

This low serum zinc levels being low in cases is statistically significant with p value <0.001. This shows that serum zinc level is low in severe pneumonia which is very significant

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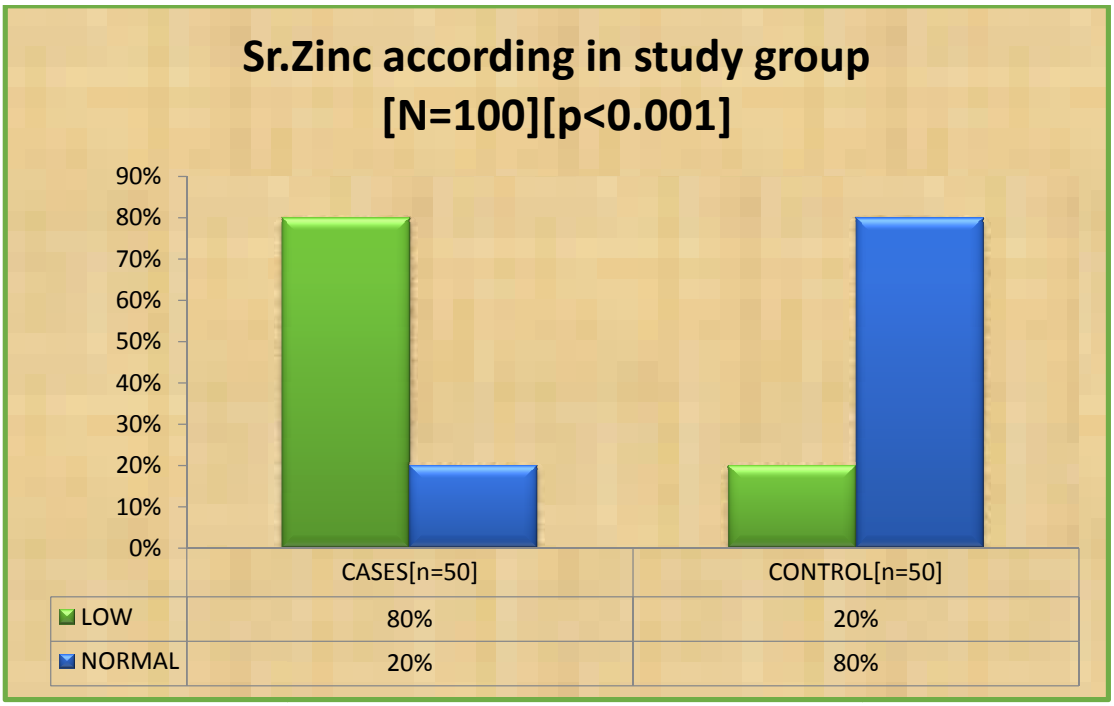
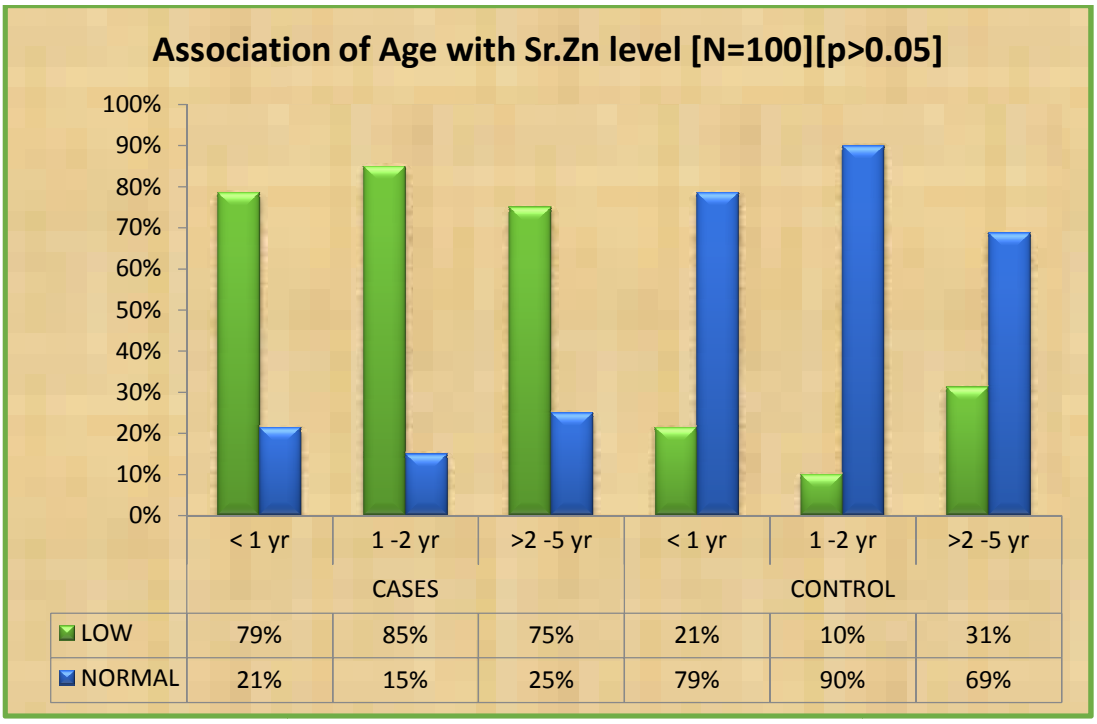


ASSOCIATION OF AGE WITH ZINC IN STUDY GROUPS

STUDY GROUP	Age	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	< 1 yr	11	3	14	28%	
	1 -2 yr	17	3	20	40%	>0.05
	>2 -5 yr	12	4	16	32%	
	Total	**40**	**10**	**50**	**100%**	
CONTROL	< 1 yr	3	11	14	28%	
	1 -2 yr	2	18	20	40%	>0.05
	>2 -5 yr	5	11	16	32%	
	Total	**10**	**40**	**50**	**100%**	

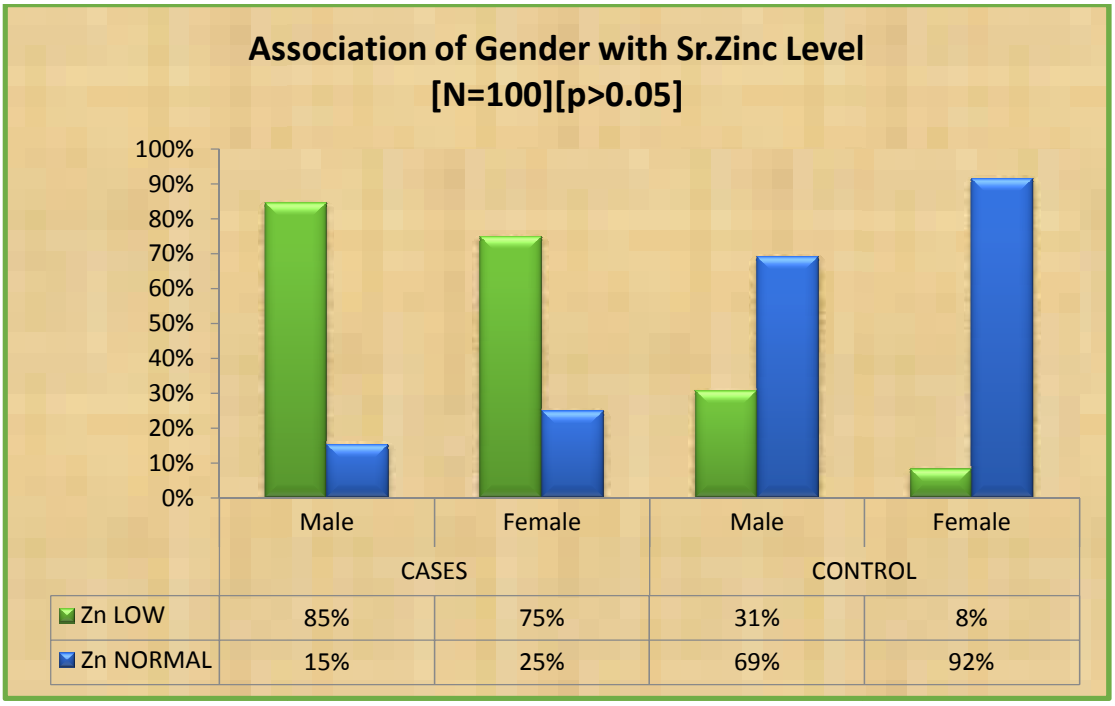
There is no statistically significant association between serum zinc level and age.



ASSOCIATION OF GENDER WITH SR.ZINC IN STUDY GROUPS

STUDY GROUP	Gender	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	Male	22	4	26	52%	
	Female	18	6	24	48%	>0.05
	Total	**40**	**10**	**50**	**100%**	
CONTROL	Male	8	18	26	52%	
	Female	2	22	24	48%	>0.05
	Total	**10**	**40**	**50**	**100%**	

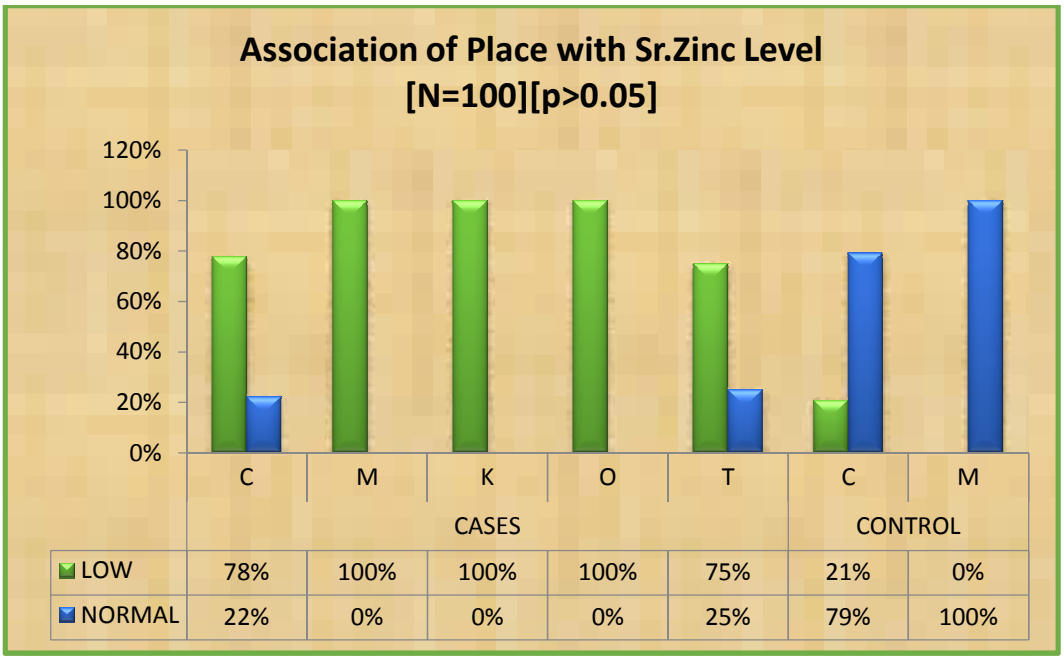
There is no statistically significant association between zinc level and gender.



ASSOCIATION OF PLACE OF RESIDENCE WITH SERUM ZINC LEVELS IN STUDY GROUP.

STUDY GROUP	Place	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	C	28	8	36	72%	
	M	3	0	3	6%	
	K	2	0	2	4%	
	O	1	0	1	2%	>0.05
	T	6	2	8	16%	
	Total	**40**	**10**	**50**	**100%**	
CONTROL	C	10	38	48	96%	
	M	0	2	2	4%	>0.05
	Total	**10**	**40**	**50**	**100%**	

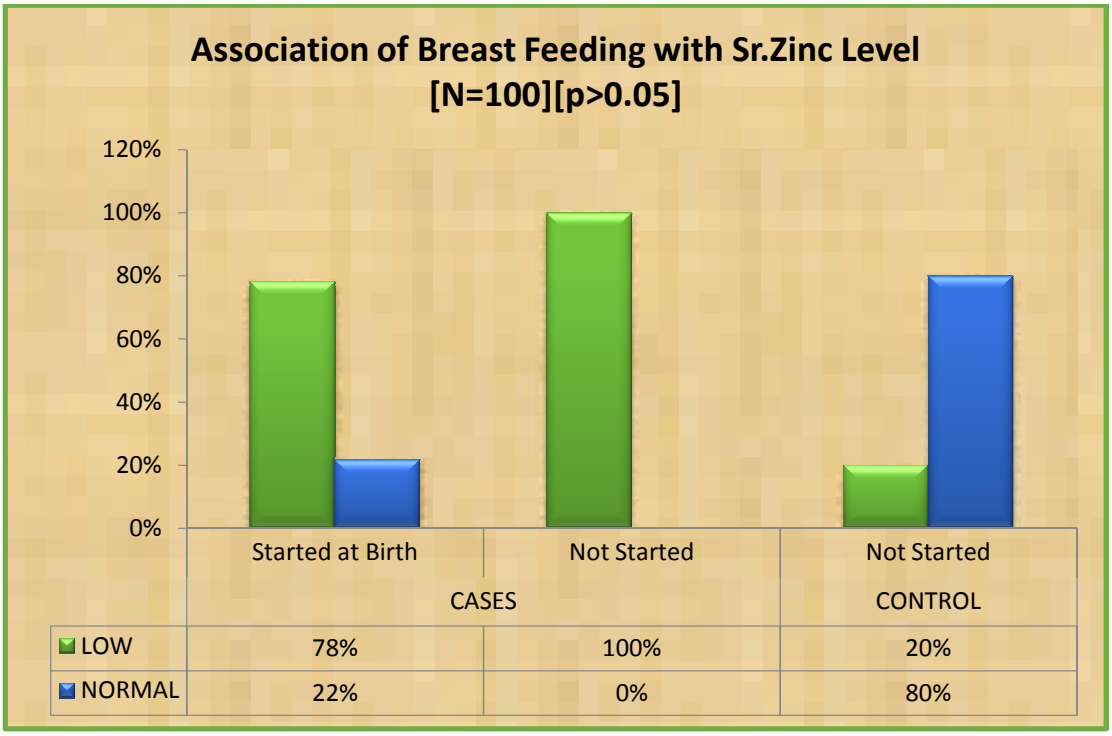
There is no statistically significant association between serum zinc level and place of residence.



ASSOCIATION OF BREAST FEEDING WITH SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	Breast Feeding	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	Started at Birth	36	10	46	92%	
	Not Started	4	0	4	8%	>0.05
	Total	**40**	**10**	**50**	**100%**	
CONTROL	Not started	10	40	50	100%	
	Total	**10**	**40**	**50**	**100%**	

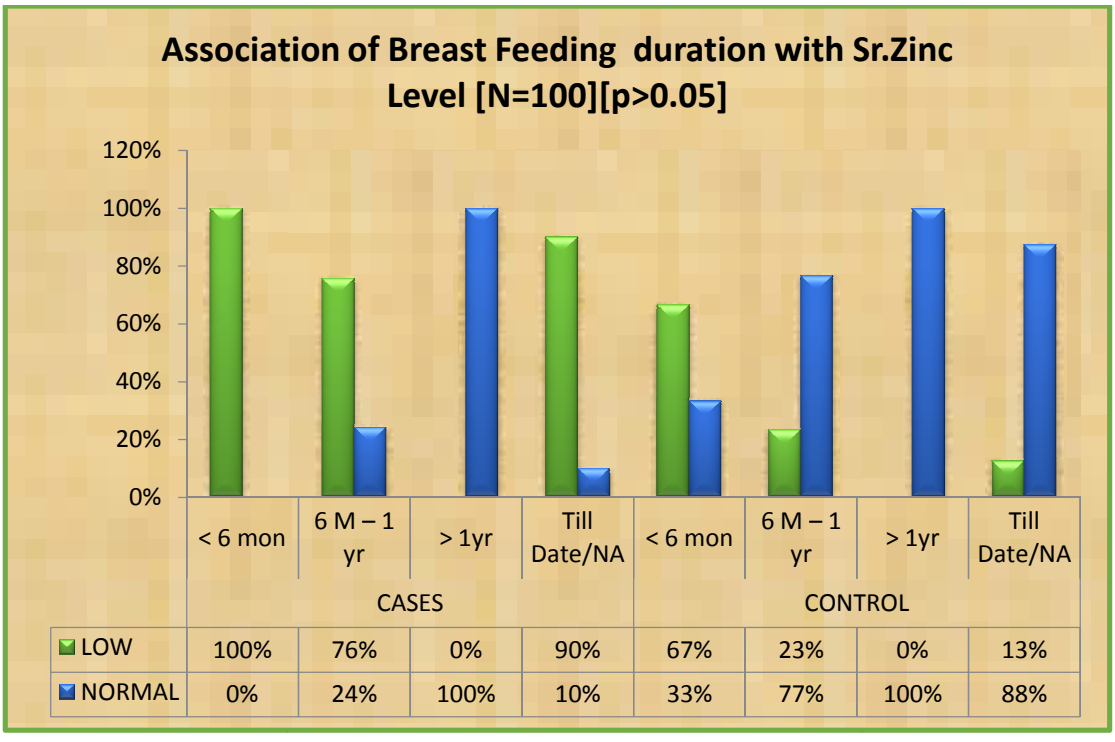
There is no statistically significant association between serum zinc level and breast feeding starting time.



ASSOCIATION OF BREST FEEDING DURATION WITH SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	Duration	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	< 6 mon	6	0	6	12%	
	6 M – 1 yr	25	8	33	66%	
	> 1yr	0	1	1	2%	>0.05
	Till Date/NA	9	1	10	20%	
	Total	**40**	**10**	**50**	**100%**	
CONTROL	< 6 mon	2	1	3	6%	
	6 M – 1 yr	7	23	30	60%	
	> 1yr	0	9	9	18%	
	Till Date/NA	1	7	8	16%	>0.05
	Total	**10**	**40**	**50**	**100%**	

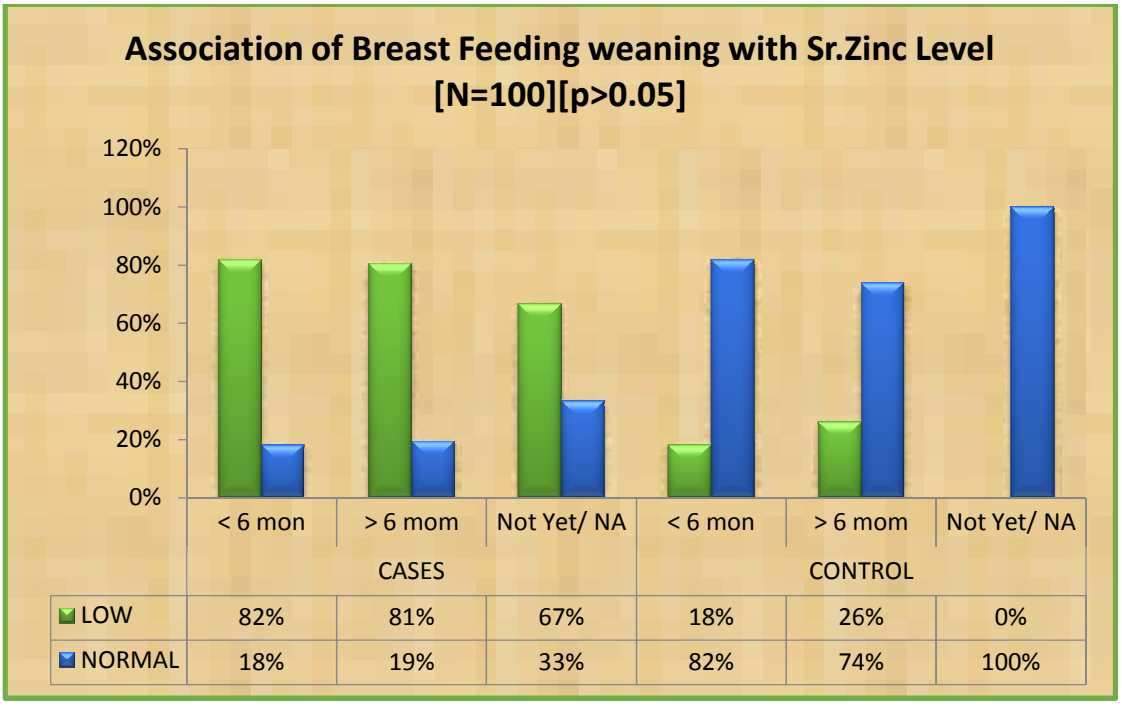
There is no statistically significant association between serum zinc level and breast feeding duration.



ASSOCIATION OF BREST FEEDING WEANING WITH SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	Weaning	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	< 6 mon	9	2	11	22%	
	> 6 mom	29	7	36	72%	>0.05
	Not Yet/ NA	2	1	3	6%	
	Total	**40**	**10**	**50**	**100%**	
CONTROL	< 6 mon	4	18	22	44%	
	> 6 mom	6	17	23	46%	
	Not Yet/ NA	0	5	5	10%	>0.05
	Total	**10**	**40**	**50**	**100%**	

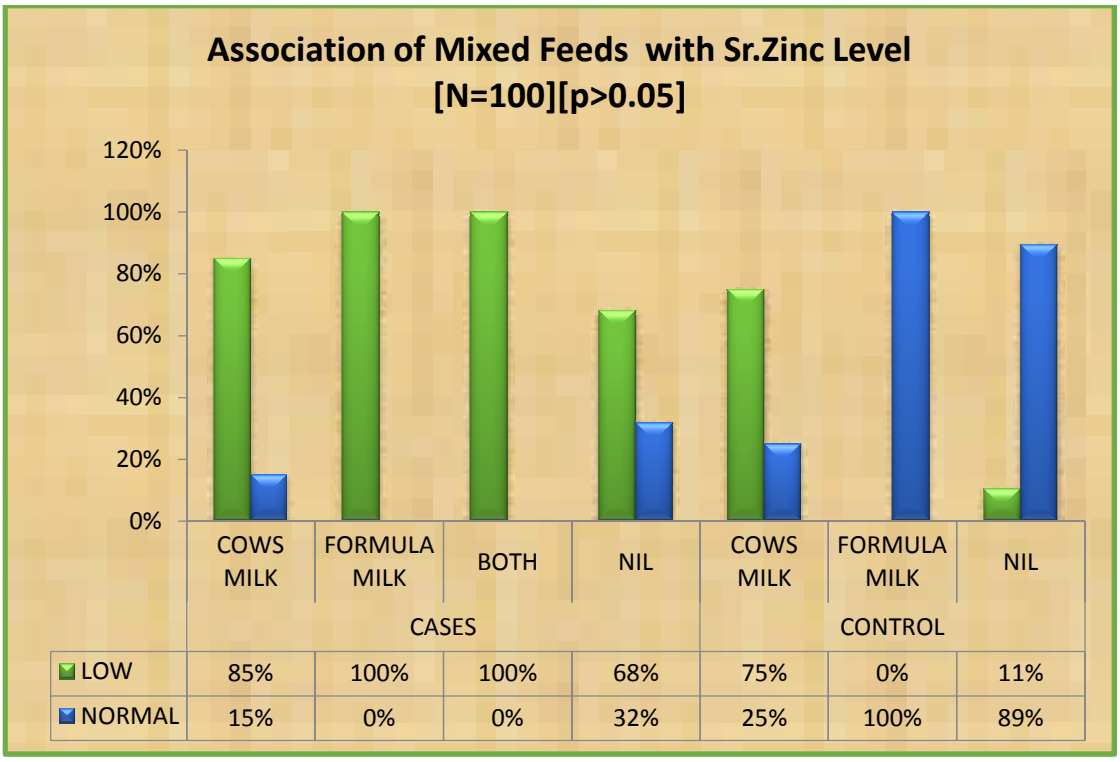
There is no statistically significant association between serum zinc level and breast feeding weaning.



ASSOCIATION OF MIXED FEEDS WITH SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	Mixed Feeds	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	COWS MILK	17	3	20	40%	
	FORMULA MILK	6	0	6	12%	>0.05
	BOTH	2	0	2	4%	
	NIL	15	7	22	44%	
	Total	**40**	**10**	**50**	**100%**	
CONTROL	COWS MILK	6	2	8	16%	
	FORMULA MILK	0	4	4	8%	
	NIL	4	34	38	76%	<0.05
	Total	**10**	**40**	**50**	**100%**	

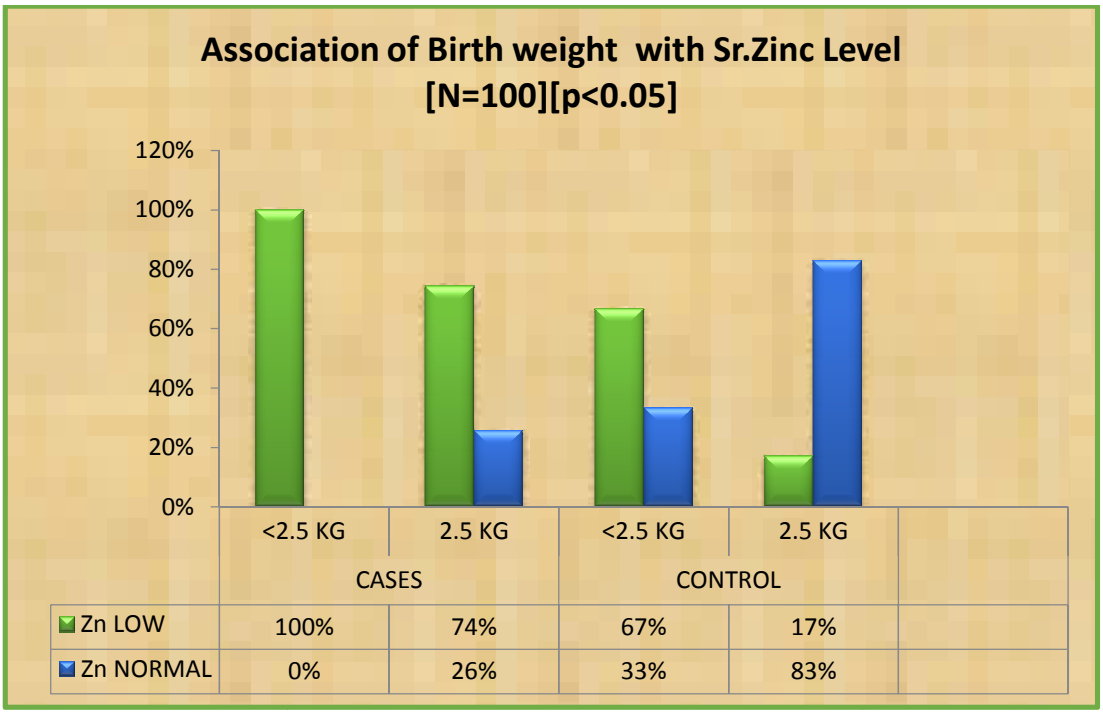
There is statistically significant association between serum zinc level and mixed feeds



ASSOCIATION OF BIRTH WEIGHTWITH SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	Birth Weight	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	<2.5 KG	11	0	11	22%	
	>2.5 KG	29	10	39	78%	<0.05
	Total	**40**	**10**	**50**	**100%**	
CONTROL	<2.5 KG	2	1	3	6%	
	>2.5 KG	8	39	47	94%	<0.05
	Total	**10**	**40**	**50**	**100%**	

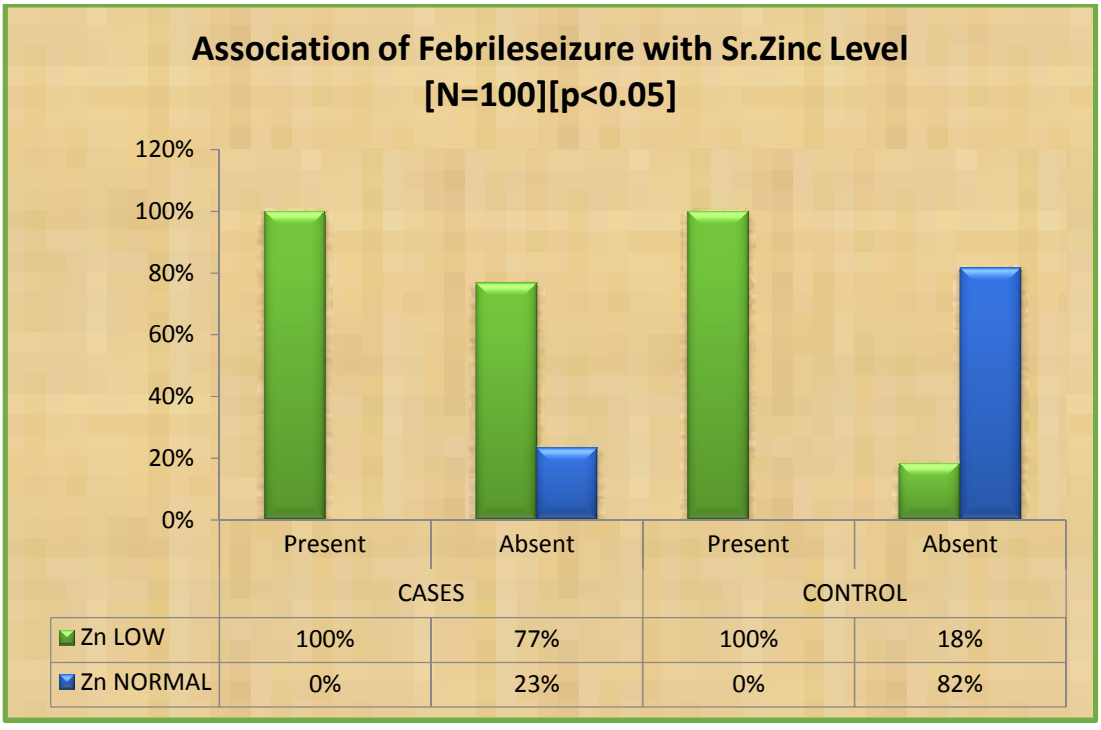
There is statistically significant association between serum zinc level and birth weight.



ASSOCIATION OF FEBRILE SEIZURE WITH LOW SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	Febrile Seizure	Serum Zinc Level		Total	(%)	Sig
		LOW	NORMAL			
CASES	Present	7	0	7	14%	
	Absent	33	10	43	86%	<0.05
	Total	**40**	**10**	**50**	**100%**	
CONTROL	Present	1	0	1	2%	
	Absent	9	40	49	98%	<0.05
	Total	**10**	**40**	**50**	**100%**	

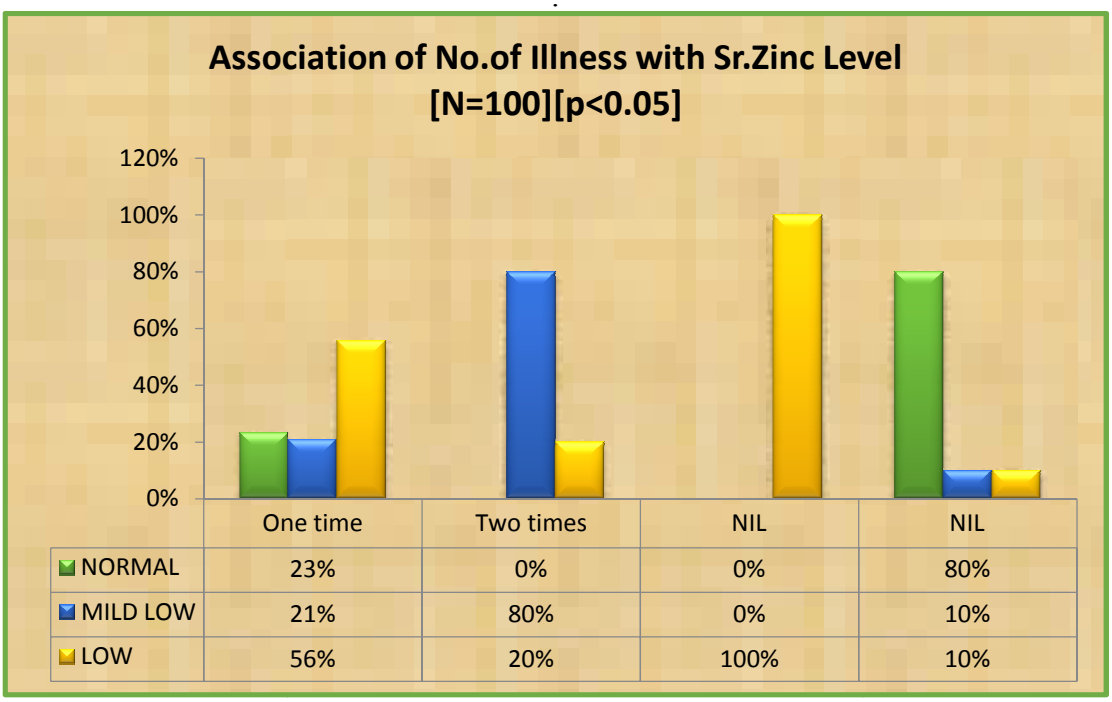
There is statistically significant association between low serum zinc level and febrile seizure.



ASSOCIATION OF NUMBER OF ILLNESSES WITHIN LAST 6 MONTHS WITH LOW SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	No of illness in last 6 mths	Serum zinc level		Low	Total	(%)	Sig
		Normal	Mild low				
CASES	One time	10	9	24	43	86%	
	Two times	0	4	1	5	10%	<0.05
	NIL	0	0	2	2	4%	
	Total	**10**	**13**	**27**	**50**	**100%**	
CONTROL	NIL	40	5	5	50	100%	
	Total	**40**	**5**	**5**	**50**	**100%**	

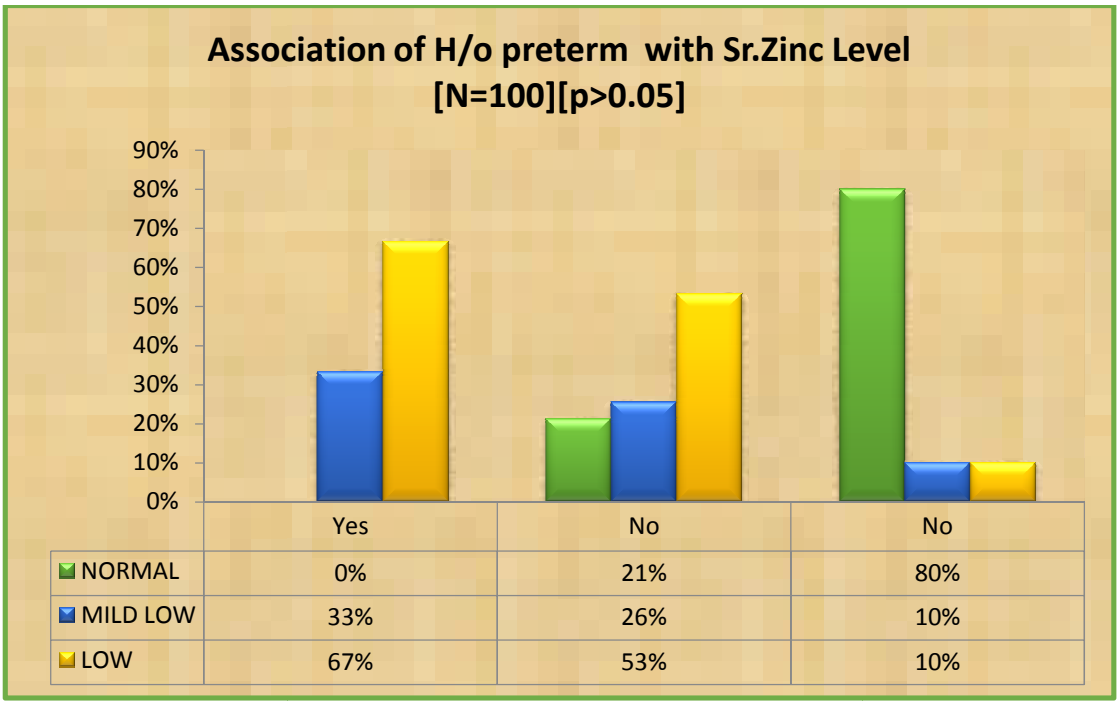
There is statistically significant association between serum zinc level and number of illnessess in last 6 months



ASSOCIATION OF TWIN/PRETERM PREGNANCY WITH LOW SERUM ZINC LEVELS IN STUDY GROUP

STUDY GROUP	Preterm	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	Yes	0	1	2	3	6%	
	No	10	12	25	47	94%	>0.05
	Total	**10**	**13**	**27**	**50**	**100%**	
CONTROL	No	40	5	5	50	100%	
	Total	**40**	**5**	**5**	**50**	**100%**	

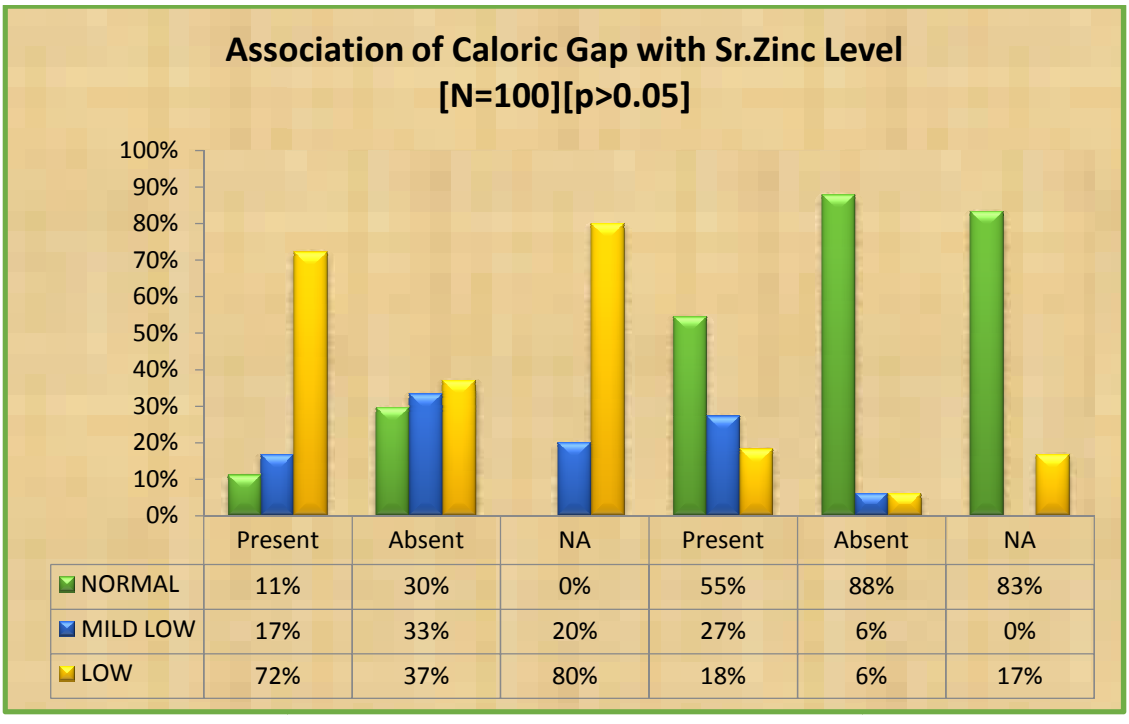
There is no statistically significant association between serum zinc level and twin/preterm pregnancy.



ASSOCIATION OF CALORIC GAP WITH LOW SERUM ZINC LEVEL IN STUDY GROUP

STUDY GROUP	Caloric Gap	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	Present	2	3	13	18	36%	
	Absent	8	9	10	27	54%	>0.05
	NA	0	1	4	5	10%	
	Total	**10**	**13**	**27**	**50**	**100%**	
CONTROL	Present	6	3	2	11	22%	
	Absent	29	2	2	33	66%	
	NA	5	0	1	6	12%	>0.05
	Total	**40**	**5**	**5**	**50**	**100%**	

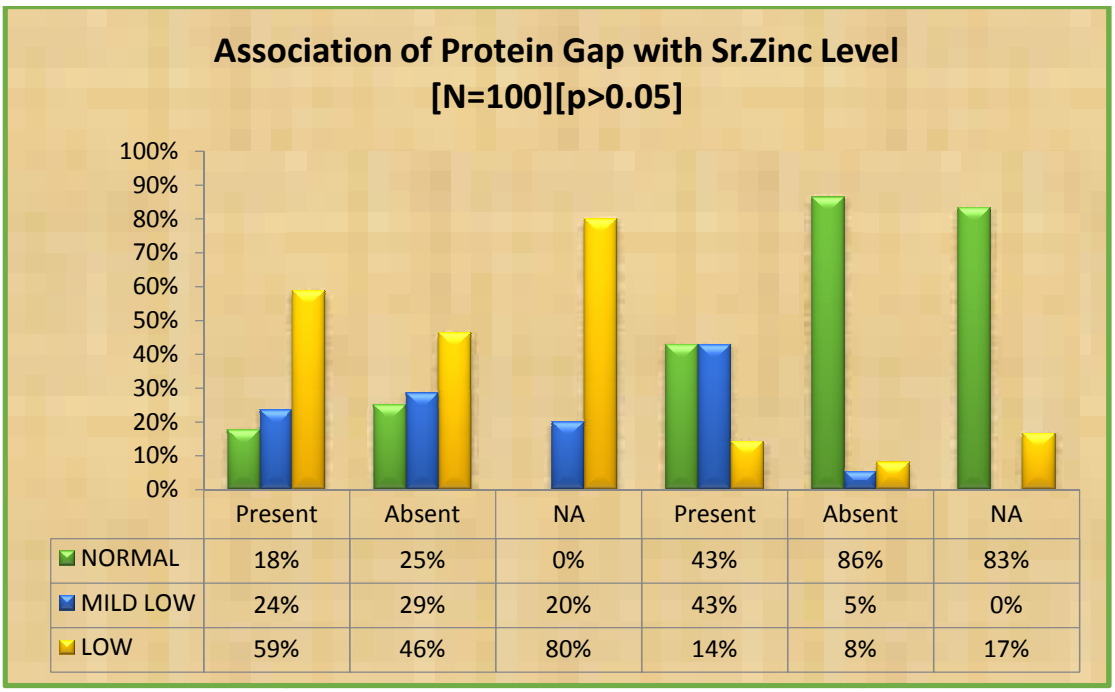
There is no significant association between caloric gap with low serum zinc level in this study group.



ASSOCIATION OF PROTEIN GAP WITH LOW SERUM ZINC LEVEL IN STUDY GROUP

STUDY GROUP		Serum Zinc Level		Low	Total	(%)	Sig
	Protein Gap	Normal	Mild Low				
CASES	Present	3	4	10	17	34%	
	Absent	7	8	13	28	56%	>0.05
	NA	0	1	4	5	10%	
	Total	**10**	**13**	**27**	**50**	**100%**	
CONTROL	Present	3	3	1	7	14%	
	Absent	32	2	3	37	74%	
	NA	5	0	1	6	12%	<0.05
	Total	**40**	**5**	**5**	**50**	**100%**	

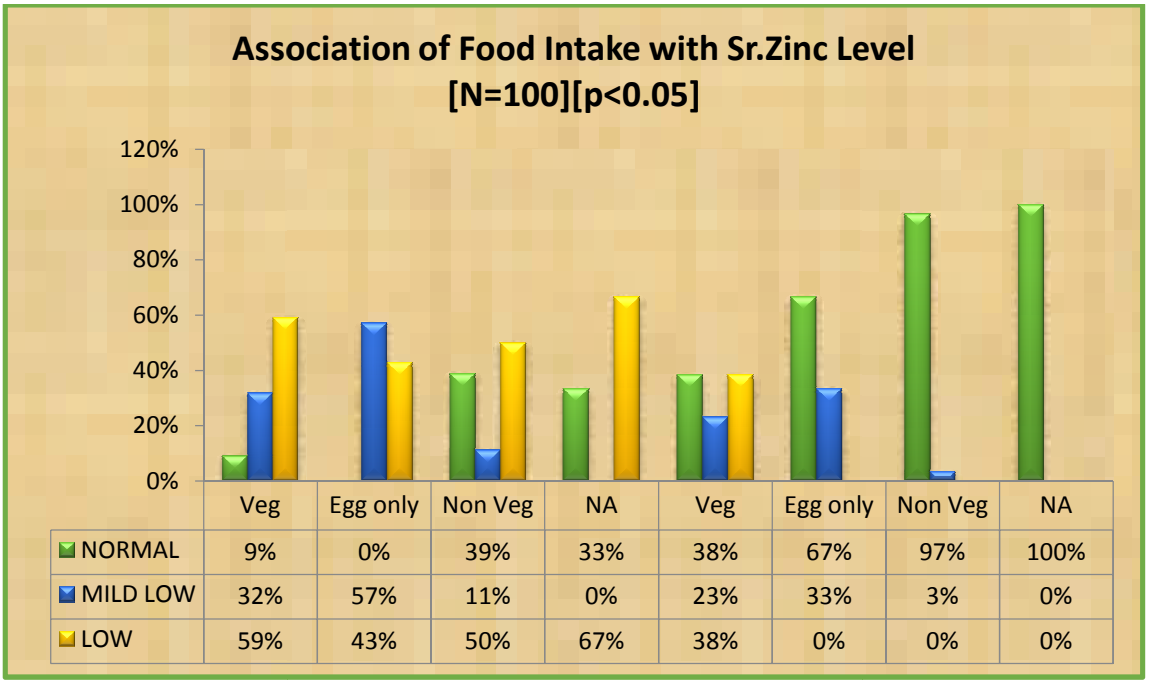
There is no significant association between protein gap with low serum zinc level in this study group.



ASSOCIATION OF FOOD INTAKE WITH SERUM ZINC IN STUDY GROUP

STUDY GROUP	Intake	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	Veg	2	7	13	22	44%	
	Egg only	0	4	3	7	14%	
	Non Veg	7	2	9	18	36%	<0.05
	NA	1	0	2	3	6%	
	Total	**10**	**13**	**27**	**50**	**100%**	
CONTROL	Veg	5	3	5	13	26%	
	Egg only	2	1	0	3	6%	
	Non Veg	29	1	0	30	60%	
	NA	4	0	0	4	8%	<0.05
	Total	**40**	**5**	**5**	**50**	**100%**	

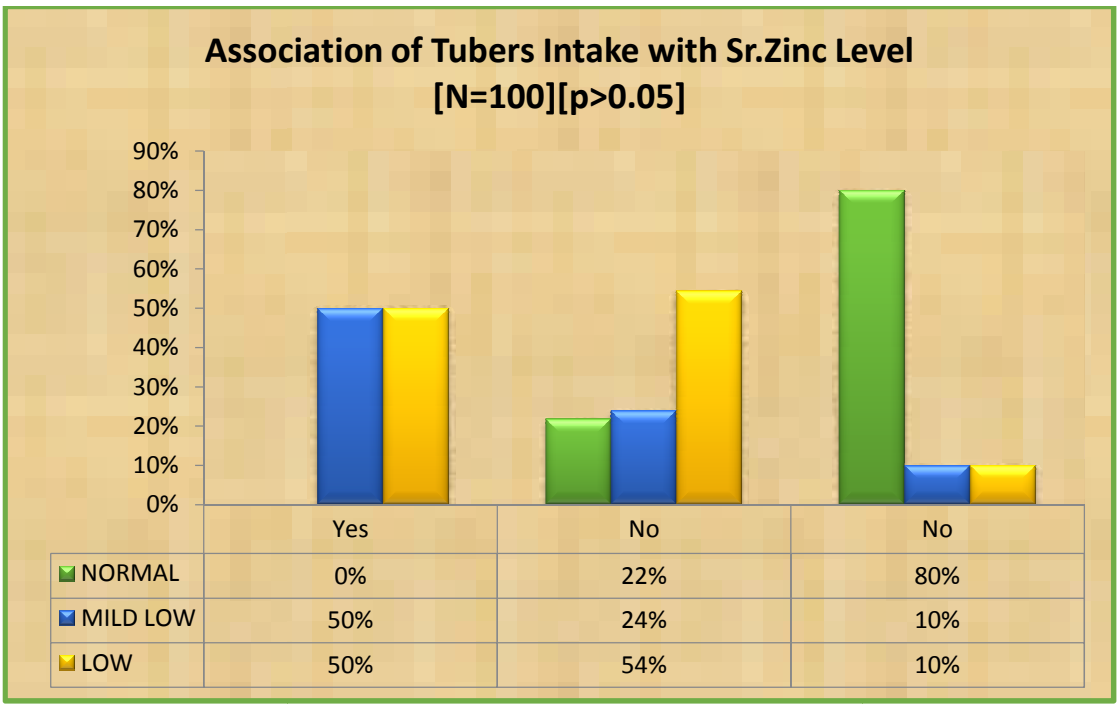
There is significant association between type of food intake and serum zinc levels. Low serum zinc level is associated with vegetarian diet.



ASSOCIATION OF TUBER INTAKE WITH LOW SERUM ZINC LEVEL

STUDY GROUP	Tubers Intake	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	Yes	0	2	2	4	8%	
	No	10	11	25	46	92%	>0.05
	Total	**10**	**13**	**27**	**50**	**100%**	
CONTROL	No	40	5	5	50	100%	
	Total	**40**	**5**	**5**	**50**	**100%**	

There is no significant association between tuber intake and low serum zinc level in this study group. This may be due to 68% of study population falls below 2 years .so no association could be seen.



ASSOCIATION OF VARIOUS EXAMINATION FINDING WITH LOW SERUM ZINC LEVELS

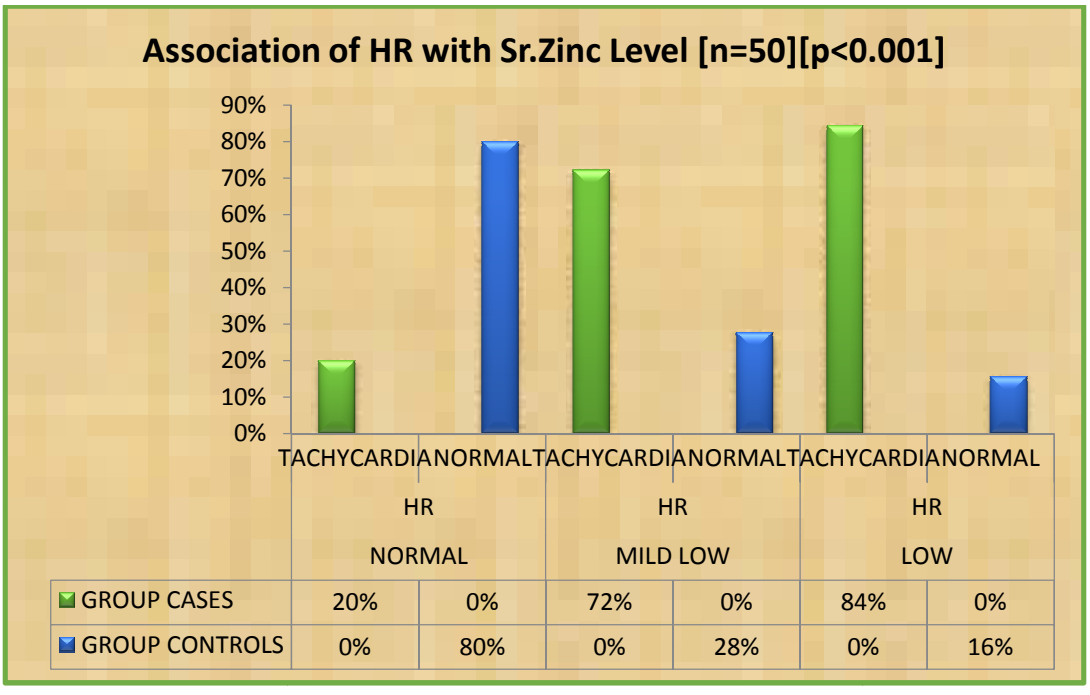
DEVELOPMENTAL MILESTONES					
NORMAL	39	80%	10	20%	
ABNORMAL	1	100%	0	0%	>0.05
IMMUNIZATION HISTORY					
UPTODATE	37	80%	9	20%	
PARTIALLY IMMUNISED	3	75%	1	25%	>0.05
FAMILY H/O SEIZURE					
PRESENT	1	100%	0	0%	
ABSENT	39	80%	10	20%	>0.05

Physical Examination according to cases					
	Serum Zinc Level				
	LOW		**NORMAL**		SIG
PALLOR					
PRESENT	1	100%	0	0%	
ABSENT	39	80%	10	20%	>0.05
ICTERUS					
PRESENT	3	100%	0	0%	
ABSENT	37	79%	10	21%	>0.05
DYSMORPHOLOGY					
ABSENT	40	80%	10	20%	>0.05
signs of vit def.					
ABSENT	40	80%	10	20%	>0.05

All parameters discussed here do not have significant association with low serum zinc level.

VITALS

HEART RATE WITH Zn LEVELS						
Serum Zinc			GROUP		Total	Sig
			CASES	CONTROLS		
NORMAL	HR	TACHYCARDIA	10	0	10	
		NORMAL	0	40	40	<0.001
	Total		10	40	50	
MILD LOW	HR	TACHYCARDIA	13	0	13	
		NORMAL	0	5	5	<0.001
	Total		13	5	18	
LOW	HR	TACHYCARDIA	27	0	27	
		NORMAL	0	5	5	<0.001
	Total		27	5	32	

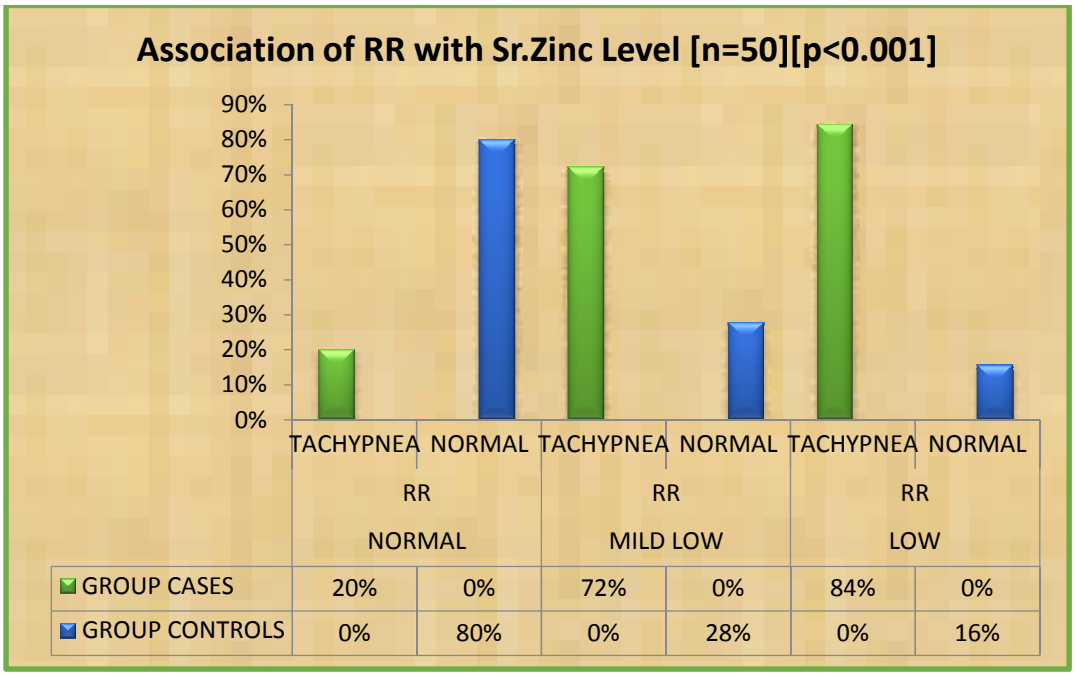


There is significant association with low serum zinc level and tachycardia.

ASSOCIATION OF SERUM ZINC LEVEL WITH RESPIRATORY RATE

RESPIRATORY RATE WITH Zn LEVELS						
Serum Zinc			GROUP		Total	Sig
			CASES	CONTROLS		
NORMAL	RR	TACHYPNEA	10	0	10	
		NORMAL	0	40	40	<0.001
	Total		10	40	50	
MILD LOW	RR	TACHYPNEA	13	0	13	
		NORMAL	0	5	5	<0.001
	Total		13	5	18	
LOW	RR	TACHYPNEA	27	0	27	
		NORMAL	0	5	5	<0.001
	Total		27	5	32	

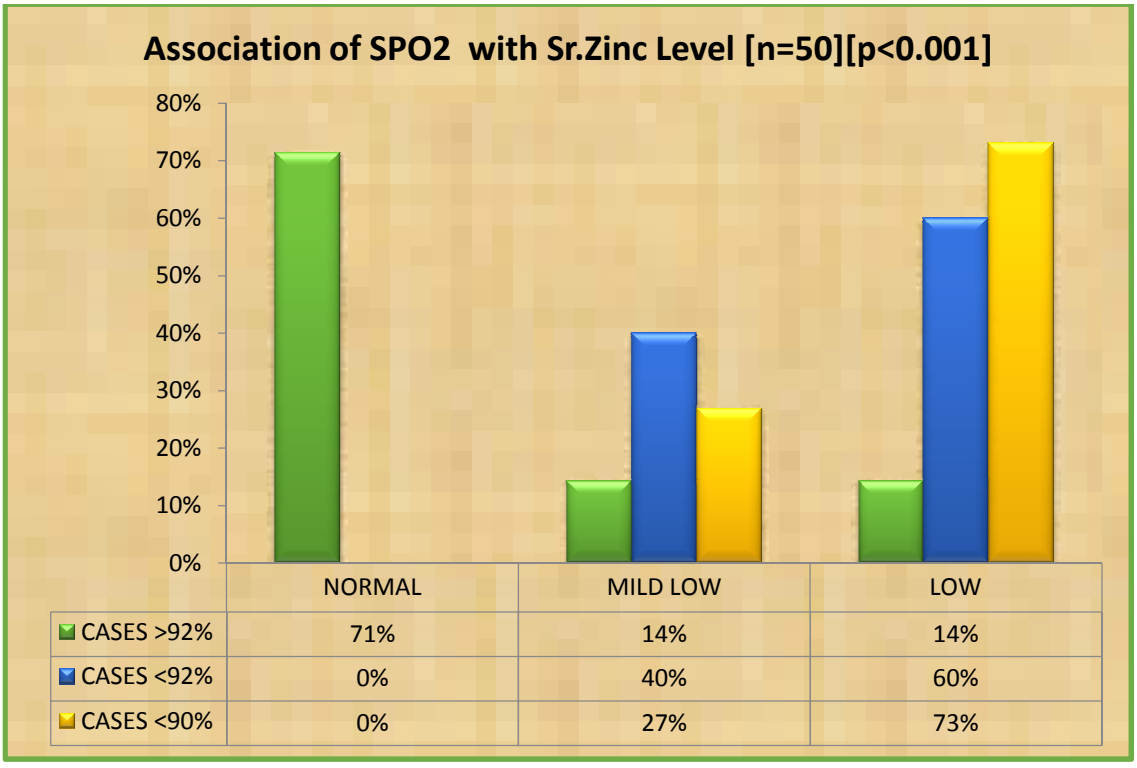
Low serum zinc level is associated with tachypnea with statistical significance.



ASSOCIATION OF LOW SERUM ZINC LEVELS WITH OXYGEN SATURATION VALUES

STUDY GROUP	SPO2	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	>92%	10	2	2	14	28%	
	<92%	0	4	6	10	20%	
	<90%	0	7	19	26	52%	<0.001
	Total	**10**	**13**	**27**	**50**	**100%**	

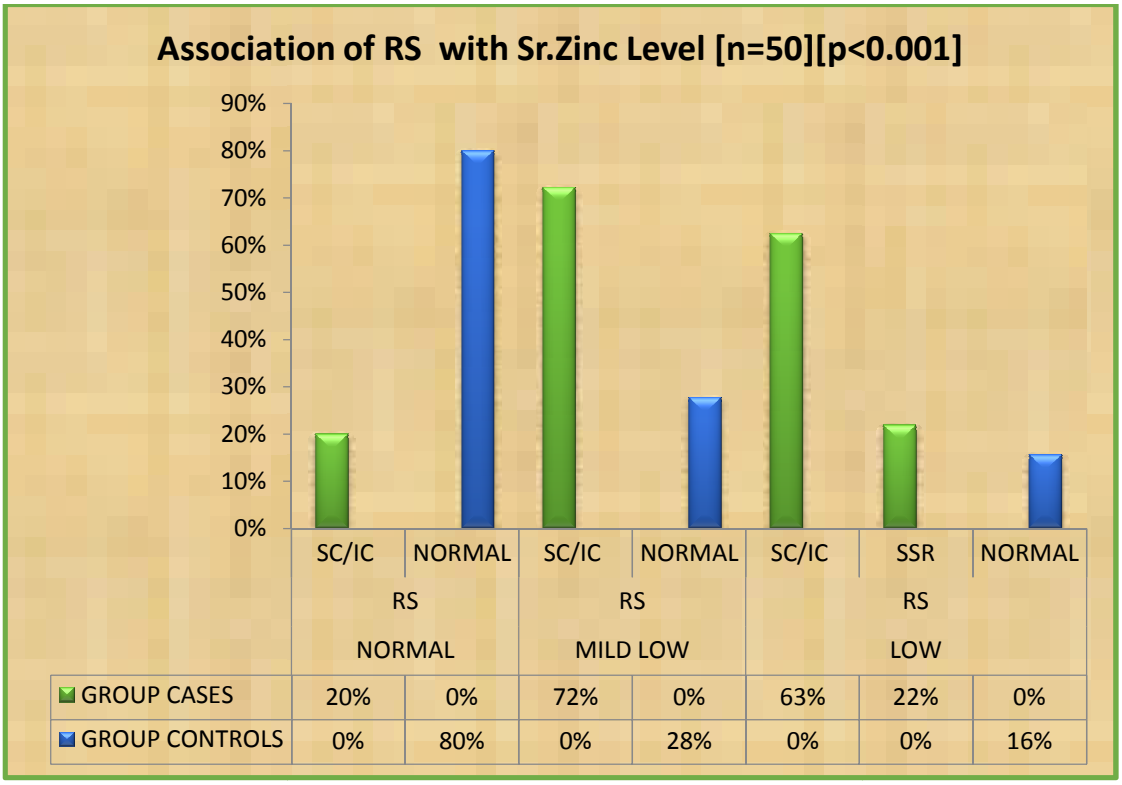
In this study there is significant association between low serum zinc level and low oxygen saturation.



ASSOCIATION OF SERUM ZINC LEVEL WITH RESPIRATORY DISTRESS

Serum Zinc			GROUP		Total	Sig
			CASES	CONTROLS		
NORMAL	RS	SUBCOSTAL / INTERCOSTAL RETRACTION	10	0	10	
		NORMAL	0	40	40	<0.001
	Total		10	40	50	
MILD LOW	RS	SUBCOSTAL /INTERCOSTAL RETRACTION	13	0	13	
		NORMAL	0	5	5	<0.001
	Total		13	5	18	
LOW	RS	SUBCOSTAL /INTERCOSTAL RETRACTION	20	0	20	
		SUPRA STERNAL RETRACTION	7	0	7	
		NORMAL	0	5	5	<0.001
	Total		27	5	32	

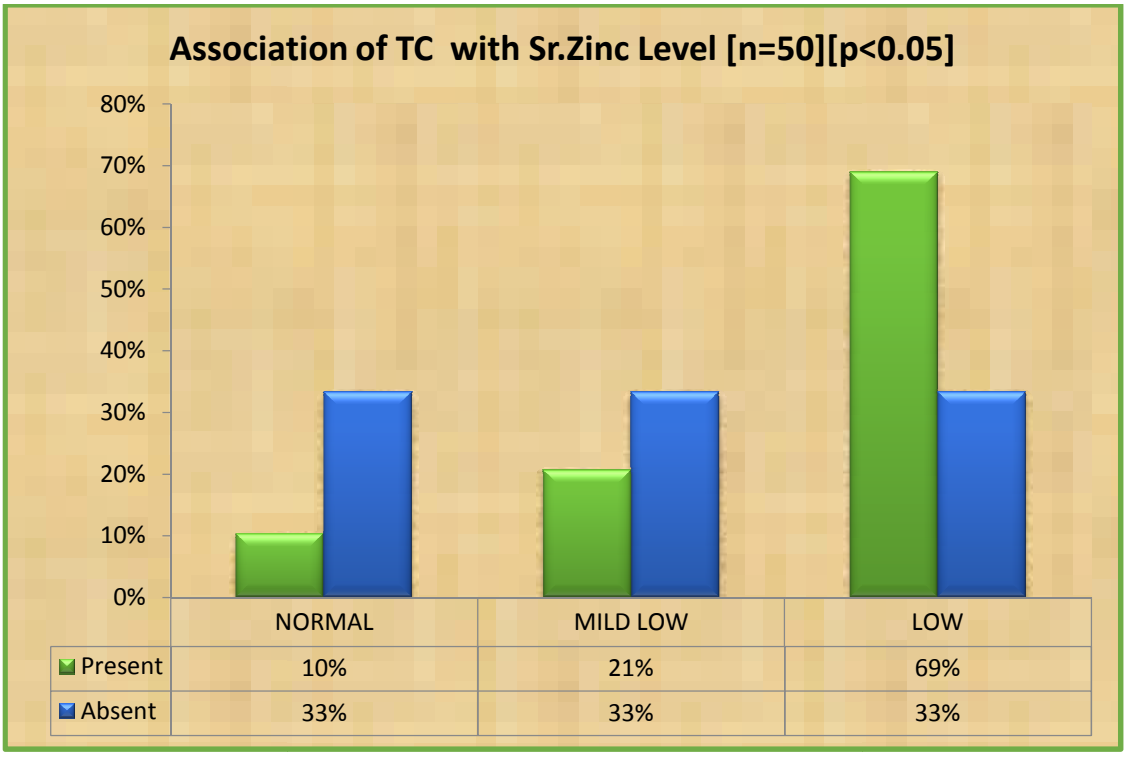
Low serum zinc levels are significantly associated with increased respiratory distress.


Association of RS with Sr.Zinc Level [n=50][p<0.001]
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
SC/IC
NORMAL
SC/IC
NORMAL
SC/IC
SSR
NORMAL
RS
NORMAL
RS
MILD LOW
RS
LOW
GROUP CASES 20% 0% 72% 0% 63% 22% 0%
GROUP CONTROLS 0% 80% 0% 28% 0% 0% 16%

ASSOCIATION OF LEUCOCYTOSIS WITH LOW SERUM ZINC LEVELS

STUDY GROUP	Leucocytosis	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	Present	3	6	20	29	58%	
	Absent	7	7	7	21	42%	<0.05
	Total	**10**	**13**	**27**	**50**	**100%**	

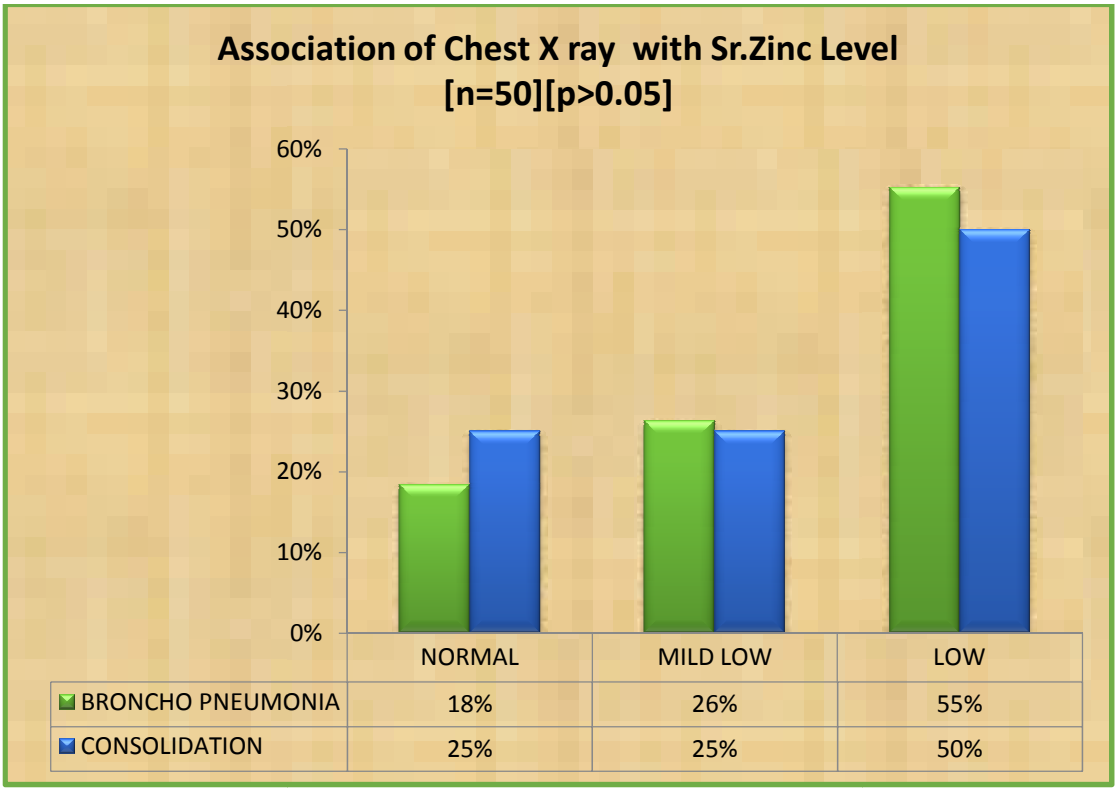
There is significant association between low serum zinc levels and leucocytosis. This is may be due to defective immune mechanism associated with low level of zinc.



ASSOCIATION OF SERUM ZINC LEVEL AND TYPE OF PNEUMONIA

STUDY GROUP	CHEST X RAY	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	BRONCHO PNEUMONIA	7	10	21	38	76%	
	CONSOLIDATION	3	3	6	12	24%	>0.05
	Total	**10**	**13**	**27**	**50**	**100%**	

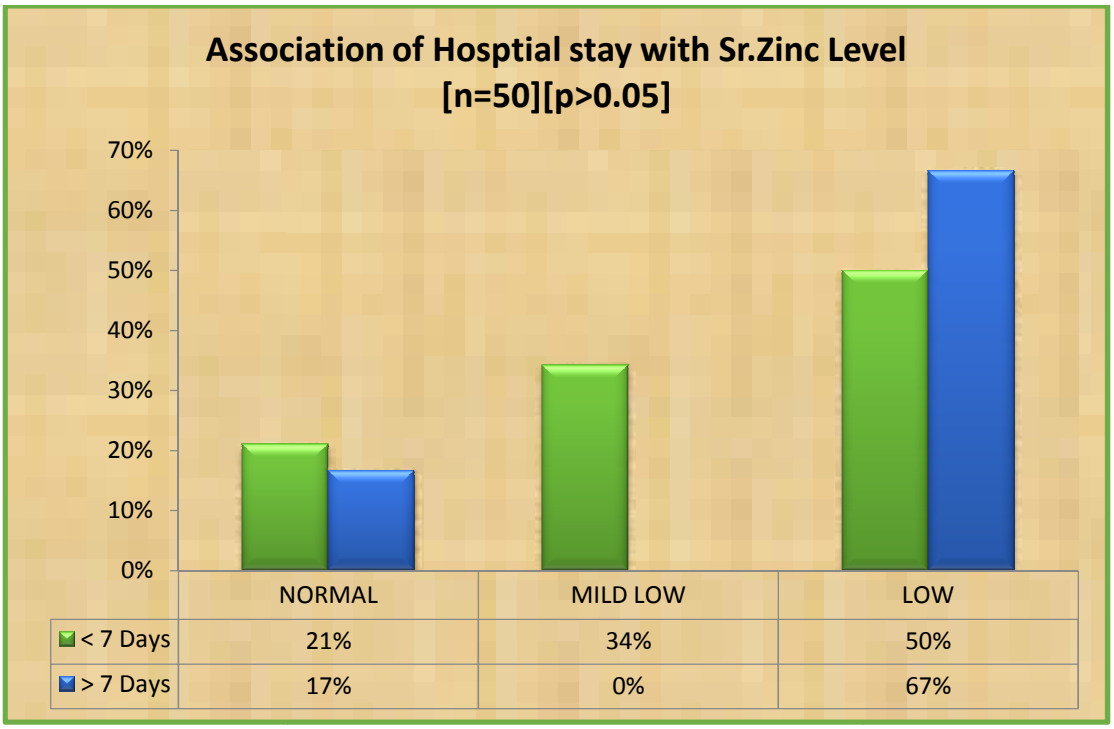
There is significant association between serum zinc level and type of pneumonia.



ASSOCIATION BETWEEN LOW SERUM ZINC LEVEL AND HOSPITAL STAY

STUDY GROUP	Hospital stay	Serum Zinc Level		Low	Total	(%)	Sig
		Normal	Mild Low				
CASES	< 7 Days	8	13	19	40	80%	
	> 7 Days	2	0	8	10	20%	>0.05
	Total	**10**	**13**	**27**	**50**	**100%**	

There is no significant association between low serum zinc level and hospital stay in this study.



Statistical Analysis:

The qualitative variables as expressed in frequency and percentage.

A Chi Square test was used to assess differences in categoric variables between groups.

Odds ratio was uesd to assess the variables.

A p value of <0.05 using a two-tailed test was taken as being of significance for all statistical tests. All data were analysed with a statistical software package. (SPSS, version 16.0 for windows)

DISCUSSION

This study is a case control study involving 50 cases and 50 controls. All age, sex and nutrition matched controls. Age group from 6 months to 5 years.

Among the study group,

68% belong to age less than 2 years.

Malnourished children as per exclusion criteria are excluded.

As the majority study group belongs to age less than 2 years, this has impact on food intake, and no association could be made between tuber intake and low serum zinc level.

In this study there is strong association between severe pneumonia(both lobar and bronchopneumonia) and low serum zinc level which is similar to study done by Md. Salin shakur, et al, 2003; and study by Saket Kumar , et al in 2003; and study by Secil Arica, et al in 2011.

Also lower the serum zinc level the higher the respiratory distress and associated with lower saturation levels which is similar to study by Hanaa I. Rady, et al in 2013.

In our study there was a slight predominance of male cases, which was also recorded in various other studies. This was explained by the fact of increased concern over the male children than the female children.

In this study there was a significant association between febrile seizure and low serum zinc level as noticed in various other studies.

SUMMARY

1. Serum zinc levels in children with severe pneumonia are low and they are statistically significant with p value of 0.001. about 80% of children with severe pneumonia had low serum zinc levels.
2. A slight preponderance of male is seen in the study group , probably social reasons which give more attention to male child may be the reason.
3. In this study group no association between low serum zinc level and variables like age, sex, place of residence, duration of breast feeding, time of weaning, preterm/twin pregnancy, calorie and protein gap were noted.
4. Also there was no significant association between low serum zinc level and developmental milestones, immunization history and family history of seizures.
5. In this study there was strong association between low serum zinc level and mixed feeds. So exclusive breast feeding seems to be protective against zinc deficiency.
6. Low birth weight has strong association with low serum zinc level.
7. Low serum zinc levels have significant association with febrile seizures

8. Increased frequency of illness in past 6 months is associated with low serum zinc levels.

9. This study shows strong association of low serum zinc levels with vegetarian diet. Non vegetarian diet is protective against zinc deficiency.

10. As 68% of study population is less than 2 years of age, intake of tubers does not have significant association with low serum zinc level.

11. In this study low serum zinc is associated with tachypnea, increased respiratory distress and low oxygen saturation.

12. Also low serum zinc level is associated with leucocytosis significantly and this may be due to increased susceptibility to infection.

13. Low serum zinc level does not have significant association with type of pneumonia that is lobar pneumonia or bronchopneumonia.

14. In this study there is no association between low serum zinc level and hospital stay. This may be due to appropriate antibiotics and supportive measures used to treat pneumonia.

CONCLUSION

In conclusion, children with severe pneumonia have low serum zinc levels and thus “Low serum zinc level is a marker of severe pneumonia”

Also lower the serum zinc level the higher the respiratory distress and associated significantly with low oxygen saturation.

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PROFORMA

NAME DATE

AGE

SEX

ADDRESS

INFORMANT

BREAST FEEDING

- STARTED
- DURATION
- WEANING
- MIXED FEEDS

BIRTH HISTORY

- BIRTH WEIGHT H/O PROGRESSIVE PALLOR
- H/O FEBRILE SEIZURES
- NO. OF ILLNESS EPISODES DURING LAST 6 MONTH
- ORDER OF BIRTH
- H/O PRETERM /TWIN PREGNANCY

DIET HISTORY

- CALORIC GAP
- PROTEIN G
- VEG/NON-VEG

- H/O INTAKE OF TUBERS
- DEVELOPMENTAL MILESTONES
- IMMUNIZATION HISTORY
- FAMILY HISTORY

PHYSICAL EXAMINATION

- APPEARANCE VITALS
- DYSMORPHISM
- PALLOR
- ICTERUS
- SIGNS OF VITAMIN DEFICIENCY

SYSTEMIC EXAMINATION

- CVS
- RS
- ABD
- CNS

INVESTIGATIONS

- CBC
- CHEST X-RAY
- SERUM ZINC LEVELS
- Duration of hospital stay
- outcome

CONSENT FORM

Your child …… is being asked to be a participant is the research study titled **"LOW SERUM ZINC LEVEL –POSSIBLE MARKER OF SEVERE PNEUMONIA"** in CMCH, Coimbatore, conducted by Dr. Kavitha .D, Post graduate student, Department of Paediatrics, Coimbatore Medical College Hospital your Child is eligible after looking on the inclusion criteria. You can able any question you may have, before agreeing to participate.

RESEARCH BEING DONE: To determine the prevalence of **LOW SERUM ZINC LEVEL –POSSIBLE MARKER OF SEVERE PNEUMONIA**..

PURPOSE OF RESEARCH:

To find it association of **LOW SERUM ZINC LEVEL – POSSIBLE MARKER OF SEVERE PNEUMONIA**.

PROCEDURE: Investigated as per protocol

DECLINE FROM PARTICIPATION: You have the option to decline from participation in the study existing protocol for your condition.

PRIVACY AND CONFIDENTIALITY: Privacy of the individuals will be respected and any information about your child provided by you during the study will be kept strictly confidential.

AUTHORIZATION TO PUBLISH RESULTS: Results of the study may be published for scientific purpose and / or presented to scientific groups; however your child will not be identified.

STATEMENT OF CONSENT:

I volunteer and consent my child to participate in the study. I have read the consent or it has been read to me. The study has been fully explained to me, and I may ask questions at any time.

…… ……

Signature / left thumb impression of parent Date:

ஒப்புதல் படிவம்

பெயர் :

வயது :

பாலினம் :

முகவரி :

அரசு கோவை மருத்துவக் கல்லூரியில் குழந்தைகள் நல மருத்துவ துறையில் பட்ட மேற்படிப்பு பயிலும் மாணவி **திருமதி டி. கவிதா** அவர்கள் மேற்கொள்ளும் "**நிமோனியா ஏற்பட இரத்தத்தில் துத்தநாகம் குறைபாடு முக்கிய காரணமா?**" பற்றிய ஆய்வில் செய்முறை மற்றும் அனைத்து விளக்கங்களையும் கேட்டுக் கொண்டு எனது சந்தேகங்களை தெரிவுபடுத்திக் கொண்டேன் என்பதை தெரிவித்துக் கொள்கிறேன்.

நான் இந்த ஆய்வில் முழு சம்மதத்துடனும், சுய சிந்தனையுடனும் கலந்து கொள்ள சம்மதிக்கிறேன்.

இந்த ஆய்வில் என்னைப் பற்றிய அனைத்து விபரங்கள் பாதுகாக்கப் படுவதுடன் இதன் முடிவுகள் ஆய்விதழில் வெளியிடப்படுவதில் ஆட்சேபணை இல்லை என்பதை தெரிவித்துக் கொள்கிறேன். எந்த நேரத்திலும் இந்த ஆய்வில் இருந்து நான் விலகிக் கொள்ள எனக்கு உரிமை உண்டு என்பதையும் அறிவேன்.

இடம்

தேதி

MASTER CHART

S.No	Name	Place	Age	Sex	breast feeding										diet history				developmental milestones	immunization history	family h/o seizures	physical examination				vitals			RS	investigations				hospital stay	outcome
					started at	duration	weaning	mixed feeds	birth weight	H/o progressive pallor	H/o febrile seizure	No of illness in last 6 mths	order of birth	h/o twin/ preterm pregnancy	caloric gap	protein gap	veg/non veg	tubers intake				pallor	icterus	dysmorphism	signs of vit def.	HR	RR	Spo2		TC	Hb	Chest xry	Serum Zinc		
1	MAHESWARI	T	3	F	1	1	2	1	2	A	A	P	2	N	P	P	3	Y	N	1	A	P	A	A	A	1	1	1	1	A	P	1	2	1	1
2	MUTHUKUMAR	C	1	M	1	2	3	3	2	A	A	0	1	N	A	A	4	N	N	1	A	A	A	A	A	1	1	1	1	A	A	1	1	1	1
3	MOHAMMED TOFIQ	C	1	M	1	4	1	3	1	A	A	0	1	T	NA	NA	2	N	N	1	A	A	A	A	A	1	1	1	1	P	A	2	2	1	1
4	RUBINA MARY	C	2	F	1	2	2	3	2	A	A	0	2	N	P	P	3	N	N	1	A	A	A	A	A	1	1	1	1	A	A	1	1	1	1
5	HARINI	M	2	F	2	NA	NA	2	1	A	A	0	1	N	A	A	2	N	N	1	A	A	A	A	A	1	1	2	1	P	A	1	2	1	1
6	KEERTHNA	C	1	F	1	2	2	3	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	1	1	P	A	1	1	1	1
7	FIYAS	T	2	F	1	2	1	3	2	A	P	0	2	N	P	P	2	N	N	2	A	A	A	A	A	1	1	3	2	P	A	1	3	2	1
8	GOKUL	C	2	M	1	2	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	1	1	1	1	A	A	1	1	1	1
9	SANJAY KUMARI	C	2	F	1	1	2	4	1	A	A	1	1	N	A	P	1	N	N	1	A	A	A	A	A	1	1	3	1	A	A	1	2	1	1
10	YUVARAJ	C	2	M	1	2	2	2	2	A	A	1	2	N	A	A	1	N	N	1	A	A	A	A	A	1	1	3	1	A	A	2	2	1	1
11	GOPIKA	C	1	F	1	4	2	4	2	A	A	1	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	2	1	A	A	1	2	1	1
12	RAJADURAI	T	2	M	1	1	1	1	2	A	A	0	1	N	P	P	2	N	N	1	A	A	A	A	A	1	1	3	1	P	P	1	3	2	1
13	DHARANISH	C	3	M	1	2	2	1	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	1	1	3	1	P	A	2	3	1	1
14	JEEVITHA	T	3	F	1	2	2	1	2	A	A	0	1	N	A	A	3	N	N	2	A	A	A	A	A	1	1	1	1	P	P	1	1	1	1
15	SUBASH	T	2	M	1	1	1	1	1	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	2	1	P	P	1	3	1	1
16	Sanjay	C	2	M	1	2	2	1	2	A	A	0	1	N	A	P	3	N	N	1	A	A	A	A	A	1	1	1	1	P	A	2	1	2	1
17	DEEPIKASRI	C	2	F	1	2	2	1	1	A	P	0	2	N	P	P	1	N	N	1	A	A	A	A	A	1	1	3	2	P	P	1	3	1	1
18	LATHAPANDY	M	1	F	1	4	2	3	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	2	1	A	A	1	2	1	1
19	LITHIKASREE	C	3	F	1	2	2	1	2	A	A	2	2	N	P	P	3	N	N	1	A	A	A	A	A	1	1	3	2	P	P	1	3	2	1
20	SATHYAMOORTHY	C	2	M	2	2	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	1	1	3	1	P	P	2	2	1	1
21	MADHUMITHA	C	3	F	1	3	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	1	1	1	1	A	A	2	1	2	1
22	DIVYABHARATHI	C	3	F	1	2	2	1	2	A	A	0	2	N	P	P	2	P	N	1	A	A	A	A	A	1	1	3	1	A	A	1	2	1	1
23	HANIFA	C	3	F	1	2	2	1	2	A	A	0	2	N	P	P	3	N	N	1	A	A	A	A	A	1	1	1	1	A	A	2	1	1	1
24	KANIMOZHI	T	1	F	1	4	2	3	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	1	1	A	A	1	1	1	1
25	ASIFA	K	3	F	1	2	1	2	1	A	P	0	2	N	P	P	3	Y	N	1	A	A	A	A	A	1	1	2	1	P	P	2	3	2	1
26	MOHAN	T	2	M	1	2	2	1	2	A	A	0	2	N	A	A	3	N	N	1	A	A	A	A	A	1	1	3	1	P	A	1	3	1	1
27	MANIKANDAN	C	2	M	1	2	2	2	2	A	A	0	1	N	P	P	2	N	N	1	A	A	A	A	A	1	1	2	1	P	A	1	2	1	1

28	SRIRAM	O	1	M	1	2	2	1	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	3	1	P	A	1	2	1	1
29	PRADEEP	C	1	M	1	2	2	3	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	2	1	P	A	1	3	1	1
30	AISHA NAZREEN	C	3	F	1	2	2	3	1	A	A	0	2	Y/T	P	P	1	N	N	2	A	A	P	A	A	1	1	2	1	P	A	2	3	2	1
31	JEEVITHA	C	1	F	1	2	2	3	1	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	1	1	3	1	A	A	1	2	1	1
32	SRINIKA	C	2	F	2	NA	1	1	2	A	P	0	3	N	P	P	1	N	N	2	A	A	P	A	A	1	1	3	2	P	P	1	3	2	1
33	ABBAS	C	3	M	1	2	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	1	1	1	1	A	A	1	1	1	1
34	KRITHIKA	C	1	F	1	1	2	1	2	A	A	0	3	N	P	A	1	N	N	1	A	A	A	A	A	1	1	3	2	P	P	1	3	1	1
35	KANNIKASRI	C	2	F	1	2	2	1	2	A	A	0	2	N	A	A	1	N	N	1	A	A	A	A	A	1	1	3	1	A	A	1	3	1	1
36	SRIRAM	C	2	M	2	NA	2	1	1	A	A	0	2	Y/P	P	P	1	N	N	1	A	A	A	A	A	1	1	3	1	A	A	1	3	1	1
37	MAHESH	C	3	M	1	1	1	1	2	A	P	1	1	N	P	A	1	N	N	1	Y	A	A	A	A	1	1	3	1	A	A	2	3	1	1
38	KISHORE	C	1	M	1	2	2	1	2	A	A	0	2	N	A	A	1	N	N	1	A	A	A	A	A	1	1	3	1	A	A	1	3	1	1
39	KALIYA	M	3	M	1	2	2	3	2	A	A	0	2	N	A	A	1	N	N	1	A	A	A	A	A	1	1	3	1	P	A	1	3	1	1
40	RILWANA	T	2	F	1	2	2	3	2	A	P	0	2	N	A	A	1	N	N	1	A	A	A	A	A	1	1	3	1	P	A	1	2	1	1
41	ARUNKUMAR	C	3	M	1	2	2	2	2	A	A	0	2	N	A	A	3	N	N	1	A	A	A	A	A	1	1	1	1	P	A	2	3	2	1
42	KANNAN	C	1	M	1	4	3	1	1	A	A	0	1	N	NA	NA	NA	NA	N	1	A	A	A	A	A	1	1	3	2	P	A	1	3	1	1
43	MUTHU KARTHIKA	C	3	F	1	2	2	3	2	A	A	0	2	N	P	P	3	N	N	1	A	A	A	A	A	1	1	2	1	A	A	1	3	1	1
44	AARUMUGAM	C	3	M	1	2	2	3	2	A	A	0	2	N	A	A	3	N	N	1	A	A	A	A	A	1	1	3	1	P	P	1	3	1	1
45	MANIKANDAN	C	1	M	1	4	2	1	2	A	A	0	2	N	NA	NA	NA	NA	N	1	A	A	A	A	A	1	1	1	1	A	A	1	3	1	1
46	MANEESH	K	3	M	1	2	2	3	2	A	A	0	2	N	P	P	1	Y	N	1	A	A	A	A	A	1	1	2	1	P	A	1	3	1	1
47	LOGESH	C	1	M	1	2	2	2	2	A	A	0	2	N	NA	NA	1	N	N	1	A	A	A	A	A	1	1	3	1	P	A	1	3	1	1
48	NAVANEETH	C	2	M	1	2	2	3	1	A	A	0	2	N	P	A	2	N	N	1	A	A	A	A	A	1	1	3	2	P	A	1	3	1	1
49	VANJINATHAN	C	2	M	1	4	1	3	2	A	A	0	1	N	NA	NA	3	N	N	1	A	A	A	A	A	1	1	3	1	A	A	1	3	1	1
50	JONES VERRONIKA	C	2	F	1	2	2	3	2	A	P	2	1	N	A	A	3	N	A	1	A	A	P	A	A	1	1	3	1	P	P	2	3	2	1

S.No	Name	Place	Age	Sex	breast feeding										diet history							physical examination				vitals			
					started at	duration	weaning	mixed feeds	birth weight	H/o progressive pallor	H/o febrile seizure	No of illness in last 6 mths	order of birth	h/o twin/ preterm pregnancy	caloric gap	protein gap	veg/non veg	tubers intake	developmental milestones	immunization history	family h/o seizures	pallor	icterus	dysmorphism	signs of vit def.	HR	RR	RS	Serum Zinc
1	VIJAYA	C	3	F	1	3	1	3	2	A	A	0	1	N	P	P	3	N	N	1	A	A	A	A	A	2	2	3	1
2	SRIRAM	C	1	M	1	4	3	3	1	A	A	0	1	N	NA	NA	4	N	N	1	A	A	A	A	A	2	2	3	1
3	MOHAMMAD HUSSAIN	C	1	M	1	4	1	3	2	A	A	0	1	N	NA	NA	2	N	N	1	A	A	A	A	A	2	2	3	1
4	VIJAYAKUMARI	C	2	F	1	3	1	3	2	A	A	0	1	N	P	P	3	N	N	1	A	A	A	A	A	2	2	3	1
5	SUGANYA	M	2	F	1	2	1	3	2	A	A	0	1	N	P	P	3	N	N	1	A	A	A	A	A	2	2	3	1
6	KALPANA	C	1	F	1	4	3	2	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	1
7	VANITHA	C	2	F	1	2	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
8	VINOD	M	2	M	1	2	1	3	2	A	A	0	2	N	P	A	3	N	N	1	A	A	A	A	A	2	2	3	1
9	VIYAZ	C	2	F	1	2	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
10	MOHAMMAD ASSAIN	C	2	M	1	3	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
11	PREMA	C	1	F	1	4	3	3	2	A	A	0	2	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	1
12	MOHAN	C	2	M	1	2	2	1	2	A	A	0	2	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	1
13	HARIHARAN	C	3	M	1	2	2	1	1	A	P	0	2	N	P	P	1	N	N	1	A	A	A	A	A	2	2	3	3
14	ASHINI	C	3	F	1	2	2	3	2	A	A	0	2	N	P	A	3	N	N	1	A	A	A	A	A	2	2	3	1
15	GANGADARAN	C	2	M	1	2	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
16	DANVANTH	C	2	M	1	2	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
17	NALINI	C	2	F	1	1	1	1	2	A	A	0	3	N	P	P	1	N	N	1	A	A	A	A	A	2	2	3	2
18	KALA	C	1	F	1	2	2	3	2	A	A	0	2	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	1
19	VANITHA	C	3	F	1	1	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
20	MUTHU	C	2	M	1	2	1	2	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
21	MANJU	C	3	F	1	2	1	3	2	A	A	0	2	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
22	KAVYA	C	3	F	1	3	2	2	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
23	NIHARIKA	C	3	F	1	3	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
24	KISHORI	C	1	F	1	2	1	2	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
25	SHANTHI	C	3	F	1	2	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
26	JOSUA	C	2	M	1	3	2	3	2	A	A	0	2	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
27	RAHUL	C	2	M	1	3	2	3	2	A	A	0	2	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
28	SANTHOSH	C	1	M	1	1	2	1	1	A	A	0	1	N	P	A	1	N	N	1	A	A	A	A	A	2	2	3	3
29	ANAS	C	1	M	1	2	1	3	2	A	A	0	1	N	A	A	NA	N	N	1	A	A	A	A	A	2	2	3	1
30	ANANTHA PADMANASRI	C	3	F	1	2	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1

31	MADHUSRI	C	1	F	1	2	1	1	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	1
32	AFSARA	C	2	F	1	2	2	3	2	A	A	0	2	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
33	JEEVAN	C	3	M	1	3	2	3	2	A	A	0	1	N	A	A	3	A	N	1	A	A	A	A	A	2	2	3	1
34	PINKY	C	1	F	1	2	3	3	2	A	A	0	1	N	A	A	4	N	N	1	A	A	A	A	A	2	2	3	1
35	RANI	C	2	F	1	2	1	3	2	A	A	0	2	N	A	A	2	N	N	1	A	A	A	A	A	2	2	3	2
36	VIGNESH	C	2	M	1	2	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
37	MURUGAN	C	3	M	1	2	2	1	2	A	A	0	1	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	3
38	ALTHAF	C	1	M	1	2	1	3	2	A	A	0	2	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	2
39	KAVYAN	C	3	M	1	2	2	3	2	A	A	0	3	N	A	A	1	N	N	1	A	A	A	A	A	2	2	3	3
40	ARUNA	C	2	F	1	2	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
41	SARAVANAN	C	3	M	1	2	1	3	2	A	A	0	2	N	P	P	1	N	N	1	A	A	A	A	A	2	2	3	2
42	MAHESWARAN	C	1	M	1	4	2	1	2	A	A	0	1	N	NA	NA	1	N	N	1	A	A	A	A	A	2	2	3	3
43	SHIFANA	C	3	F	1	2	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
44	LINGESH	C	3	M	1	2	2	1	2	A	A	0	1	N	P	P	3	N	N	1	A	A	A	A	A	2	2	3	2
45	BALAMURUGAN	C	1	N	1	4	3	3	2	A	A	0	1	N	NA	NA	NA	N	N	1	A	A	A	A	A	2	2	3	1
56	RAVI	C	3	M	1	3	2	3	2	A	A	0	2	N	P	A	3	N	N	1	A	A	A	A	A	2	2	3	1
47	RAMESH	C	1	M	1	4	1	3	2	A	A	0	1	N	NA	NA	2	N	N	1	A	A	A	A	A	2	2	3	1
48	SARVESH	C	2	M	1	2	1	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1
49	ROSHAN	C	2	M	1	4	1	3	2	A	A	0	1	N	NA	NA	3	N	N	1	A	A	A	A	A	2	2	3	1
50	MAHESWARI	C	2	F	1	2	2	3	2	A	A	0	1	N	A	A	3	N	N	1	A	A	A	A	A	2	2	3	1

KEY TO MASTER CHART

Age

< 1 yr 1

1 -2 yr 2

>2 -5 yr 3

Breast feeding		duration		WEANING	
Started at birth	1	< 6 mon	1	> 6 mon	1
Not started	2	6 mon – 1 yr	2	< 6 mo	2
		>1 yr	3	not yet/NA	3
		Till date/NA	4		

MIXED FEEDS

COWS MILK 1

FORMULA MILK 2

NIL 3

BOTH 4

BIRTH WEIGHT

<2.5 KG 1

2.5 KG 2

PROGRESSIVE PALLOR PRESENT/ ABSENT

FEBRILE SEIZURE PRESENT / ABSENT

NO OF ILLNESS LAST 6 MON 0,1,2,

REGULAR AN VISITS YES/NO

BIRTH ORDER 1-1, 2-2, >3 – 3

H/O PRETERM , TWIN Y/N

DIET HISTORY

CALORIE GAP PRESENT/ABSENT/NA

PROTEIN GAP PRESENT/ABSENT/NA

VEG 1

EGG ONLY 2

NON VEG 3

NA 4

H/O INTAKE OF TUBERS

2 TIMES A WEEK Y/N

DEVELOPMENTAL MILESTONES NORMAL/ABNORMAL

IMMUNISATION UPTODATE 1

PARTIALLY IMMUNISED 2

FAMILY H/O SEIZURE PRESENT /ABSENT

DYSMORPHOLOGY PRESENT/ABSENT

PALLOR PRESENT/ABSENT

ICTERUS PRESENT/ABSENT

HEART RATE	RESPIRATORY RATE	SPO2
TACHYCARDIA 1	TACHYPNEA 1	>92% 1
NORMAL 2	NORMAL 2	<92% 2
		<90% 3

RESPIRATORY SYSTEM

SUBCOSTAL /INTERCOSTAL RETRACTION 1

SUPRA STERNAL RETRACTION 2

NORMAL 3

COMPLETE BLOOD COUNT

LEUCOCYTOSIS PRESENT/ABSENT

ANEMIA PRESENT /ABSENT

CHEST X RAY

BRONCHO PNEUMONIA 1

CONSOLIDATION 2

SERUM ZINC LEVEL

>65 mcg 1

50 – 64 mcg 2

<50 mcg 3

HOSPITAL STAY

<7 DAYS 1

>7 DAYS 2

OUTCOME

DISCHARGE 1

DEATH 2